ELECTRICAL REVIEW

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Managing Editor: HUGH S. POCOCK, M.I.E.E. *Technical Editor:* W. O. FENWICK, M.I.E.E.
Industrial Editor: J. H. COSENS *Technical Consultant:* C. O. BRETTELLE, M.I.E.E.

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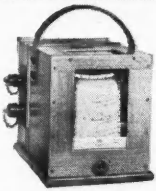
Some other instruments...

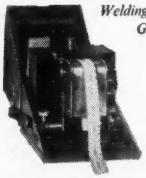
Battery Charge Indicator

Neutral Displacement Relay

500kV Electrostatic Voltmeter

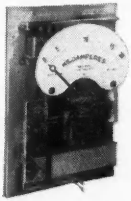


Railway Speed Grapher

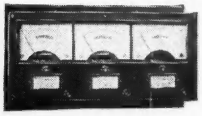


Welding Cycle Grapher

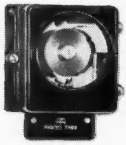
Marine Type Overload Relay



Welding Current Peak Ammeter



3-phase High Speed Maximum Reading Ammeter



"Weathering Test" Cycle Controller

H. F. Output Meter

...from

EVERETT EDGCUMBE

Makers of electrical instruments for indicating, recording and controlling; photometric apparatus; process controls.

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ELECTRICAL REVIEW 29th AUGUST, 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLI • NO. 3901

The Reheat Cycle

THE outstanding performance of Dunston "B 2" power station at the head of the latest B.E.A. thermal efficiency list and probably that of Europe has reawakened interest in the prospects for re-superheating steam between high- and low-pressure turbine cylinders. Steam conditions, at 600 lb/sq in and 850 deg F with reheat to the initial temperature, are moderate for the kW ratings at Dunston and even better results are to be expected from Littlebrook "B" with 1,235 lb and 825 deg and from projected stations with 100 MW sets, such as the new one at Ferrybridge. The extent of the thermo-dynamic and other gains due mainly to lower leaving exhaust losses with reheating have been worked out by Mr. J. C. London (*Electrical Review*, 15th August). The view once prevalent that high initial steam temperatures lessened the value of re-superheating between cylinders does not appear to be substantiated. While the improvement through reheat at, say, 600 lb/sq in and 850 deg F may amount to a considerable proportion of that obtainable by raising steam conditions, the simultaneous application of the two is additive in effect.

The importance of high return temperatures was illustrated at North Tees power station, where in 1918 reheating was first used commercially at the instance of the late Dr. Charles Merz. The quality of wartime steel available for the low-pressure cylinders limited the reheat temperature to 500 deg F and the gain in efficiency was not enough to offset the capital cost and complications of the additional valves and pipework. These complications have not, we are informed, been found serious disadvantages in more modern installations, particularly since it has proved practicable to bring boiler and turbine into service as a complete unit instead of delaying the raising of reheat temperature until after synchronizing. Difficulty was also expected in running reheat sets except on base loads but a 40 MW set (350 lb/sq in and 700 deg F) installed at Barking "A" station in 1924 is still operated on a two-shift programme. The

pioneer installation at North Tees clearly indicated the potentialities of the system and influenced practice in the United States, where about 6,000 MW of reheat plant is now installed and about 15,000 MW is reported to be on order. Although reheating entails somewhat higher capital expenditure this seems likely to be offset by fuel saving since, as Mr. London points out, with rising fuel costs and load factor the gain in thermal performance of large steam plant becomes of increasing value.

RURAL DELAYS

We do not believe, as the Friends of the Lake District assert, that an Electricity Board faced with opposition to an overhead line is now liable to plead that because of capital restrictions the scheme cannot be proceeded with. Such a case will, no doubt, be decided on its comparative merits, but with so many rural districts clamouring for electricity it is perhaps natural that a Board, other things being equal, may decide to proceed with unopposed work first. Otherwise all its rural work might be held up until the usual "planning" procedure had been followed.

BUYERS' MARKET

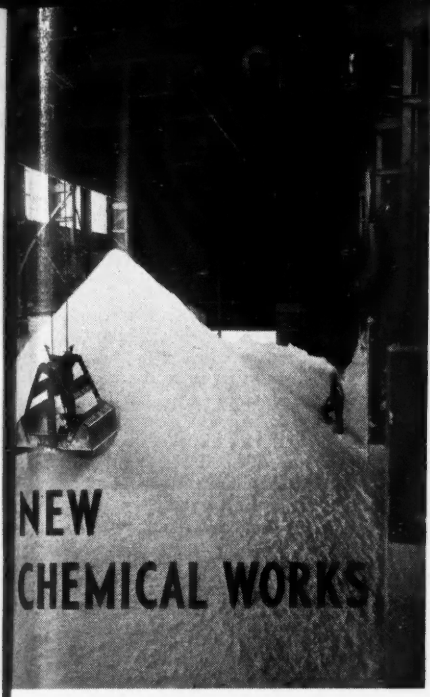
A number of factors have combined to necessitate an entire change in the outlook of manufacturers towards their customers. Chief among them have been the clearing off of wartime arrears and the growing "tightness" of money. No longer can it be expected that orders will come along naturally or that customers will bide the manufacturers' time and willingly pay the prices demanded. Two aspects of the subject have been dealt with in the *Electrical Review*. Last week Mr. M. C. Blythe called for consideration by manufacturers of the new conditions set up by the emergence of national boards as extremely important customers and suggested a revision of selling methods. In this issue Mr. A. C. Johnson draws attention to the need for the revival of active salesmanship in the electrical appliance business which he regards as almost a lost art. In this business it has become necessary to combat a number of false ideas put over, more or less subtly, by solid fuel and gas interests. This means a serious study of the facts and the presentation of reasonable arguments: mere "high-pressure" salesmanship will not meet the case.

ENGINEERING WAGES

Mr. Jack Tanner, of the Amalgamated Engineering Union, stood up well to a number of searching questions put to him by journalists in a television session last week. The main theme, of course, was the claim of the engineering unions for higher wages. Mr. Tanner made much of the improvement in productivity in the engineering industry since the war. He said that the unions' view was that the employers should not secure all the benefits arising from this improvement; they wanted a fair share. No mention was made of the third party—the customer—although he is now assuming greater importance, particularly if he lives overseas.

TRADE WITH AMERICA

A further indication of the anxiety of American governmental agencies to encourage trade with Europe is given in the latest report by the United States Director of Defense Mobilization to the President. Reference is made to the widening trade gap of Western European countries, particularly that of the United Kingdom, which has led to the imposition of import restrictions. The Director says that these countries must have access to the American market in order to maintain their reserves above danger levels and to prevent further contraction of their dollar imports to the detriment of defence production efforts and economic stability.

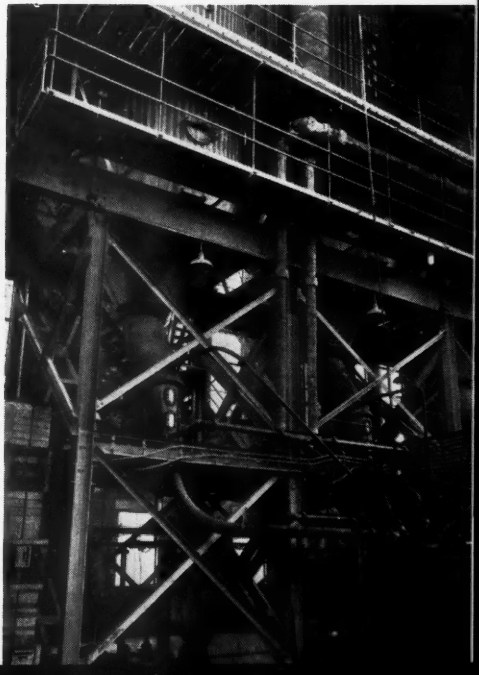


Electrolytic Process for Producing Chlorine and Caustic Soda from Brine

THE provision of private generating plant, both d.c. and a.c., an electrolytic processing system and a wide range of electrically driven machinery, including pumps, air compression and refrigeration equipment, lends particular electrical interest to a new factory which Murgatroyd's Salt & Chemical Co., Ltd., has opened at Elworth, near Sandbach, Cheshire. Originating primarily from the company's desire to increase salt output, the enterprise also warrants special attention as an example of a highly integrated scheme in which, in order to make the maximum economic use of raw materials, power and steam supplies, the scope of production was expanded to include direct and indirect products of brine electrolysis such as liquid chlorine, caustic soda, sodium hypochlorite and hydrochloric acid.

Brine, the basic raw material used in the factory, is pumped from wells at Middlewich 2½ miles away. Some is bled off for the production of salt by the old open pan method; the remainder is purified and settled in large tanks, compressed air being employed to mix the reactants (caustic soda and sodium carbonate). After filtering, the purified brine is divided into two approximately equal streams, one of which is used directly for making salt and one, after further filtration, for electrolysis to produce the other items mentioned above, as well as further salt.

For the main salt production a triple effect evaporator is employed. This is heated by steam at a pressure of 15 lb/sq in and all three of the evaporator bodies are equipped with electrically operated agitators. An air pump and a barometric condenser maintain a vacuum in the last effect. Salt produced by this process is collected at the bottom of the conical bases of the evaporator bodies, and the slurry containing 20–30 per cent of the salt is taken by centrifugal pumps to the filtration and drying section of the plant which also handles salt crystallizing out during the



Above: **Recovery of the salt from store is carried out by means of an overhead grab crane.** *Right:* **Triple-effect evaporator used in salt production.**

The Hooker diaphragm cells used for the electrolysis of brine to produce chlorine, etc.

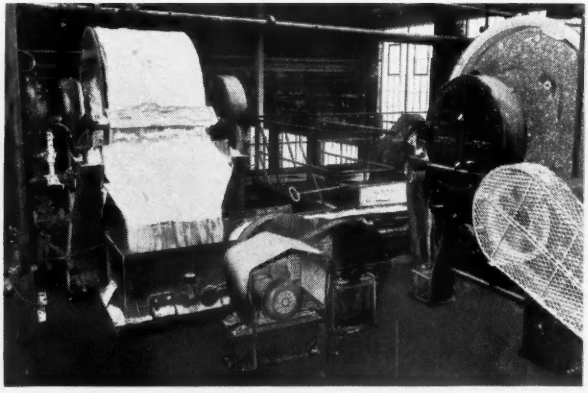
evaporation of the caustic liquid to be referred to later.

"Rovac" rotary filters (International Combustion, Ltd.) driven by 2½ h.p. motors separate the salt from this slurry, the filtrate being returned to the evaporator. From the filter the salt ("unstoved vacuum salt" as it is called at this stage) is carried by a series of conveyors to storage bunkers, which are divided into two sections, one for salt from the evaporator and one for salt produced during manufacture of caustic soda. Recovery from the storage hoppers is carried out by means of a Herbert Morris overhead grab crane. Further mechanical handling aid is provided here and elsewhere by battery-operated mobile trucks both of the fork lift and lifting platform types (Wingrove & Rogers).

Much of the salt is sold without further drying, but for table use and various other purposes the salt is thoroughly dried by passing it through rotary kiln dryers (driven by 30 h.p. B.T.H. motors) in which the air is heated by high pressure steam. The resulting "stoved vacuum salt" is carried away from the dryers by means of bucket-type elevators to monel-lined storage bunkers. From here it is automatically weighed into bags and taken by conveyor either to store or direct to the despatch department.

In the part of the factory used for the manufacture of caustic soda, chlorine, etc., the purified brine is first passed through a two-stage heater, being resaturated with salt slurry (obtained from the caustic evaporator plant) between the two stages. The resulting solution is pumped at a temperature of 90–95 deg C to a tank from which "Pyrex" glass pipelines (chosen principally on account of their electrical insulating characteristics) gravity feed a bank of Hooker diaphragm cells. These cells, which are the first of this design to be used in this country, were constructed in Murgatroyd's own workshops. They are housed in a room adjoining the power house so as to make the d.c. connecting leads as short as possible.

Each cell comprises a concrete base (raised from the floor on insulated pedestals) containing the anodes, a steel-framed cathode section and a dome-shaped concrete top in which the chlorine collects. The graphite anode plates are mounted vertically, the lower ends being cast in a layer of lead which forms the electrical



Rotary filters remove all but 4-5 per cent of the water from the salt

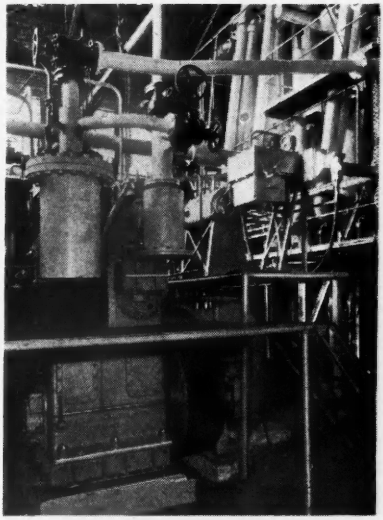
connection with a copper rod by which the current is introduced. A layer of bitumen composition forms a barrier between the lead and the brine in the cells, thus preventing electrochemical attack.

The cathode, which is designed to provide a large active surface in close proximity to the anode, consists of wire mesh welded to the steel frame and corrugated in such a way as to form cathode surfaces between adjacent anodes. The wire mesh is completely covered with an asbestos diaphragm formed by applying suction to the interior of the cathode "box" while the whole unit is immersed in a bath containing a suspension of asbestos pulp.

The cells are connected in series to the d.c. supply, the potential difference across each cell being approximately 3·5 V. Since the total voltage used in the cell room is relatively high, exceptional precautions have been taken in the insulation of floors, steel work and cell components.

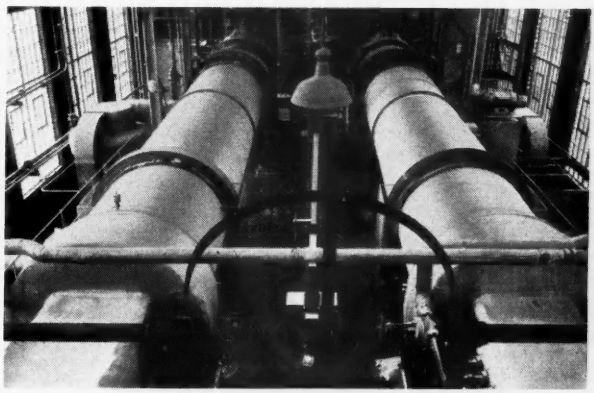
Caustic soda leaves the cathode compartment of the cells as an 11·5 per cent solution containing a similar quantity of salt. Before marketing, this solution has to be concentrated to 50 per cent if required in liquid form, or to 100 per cent if caustic soda is wanted as a solid. Evaporation to 50 per cent caustic is carried out in two stages (utilizing steam at a pressure of 15 lb/sq in) first in a double-effect evaporator to 36 per cent and secondly in a single-effect evaporator to 50 per cent. All the tanks, pipework, centrifugal pumps (Sulzer Bros., Ltd., and British LaBour Pump Co., Ltd.), etc., in contact with the caustic solution are of nickel.

Most of the salt in the solution is crystallized out in the double-effect evaporator. From the separating vessel the slurry is passed through rotary filters, the cake formed being washed with water and brine to remove entrained caustic soda. Further treatment removes sodium sulphate from the cake which is repulped, refiltered and reslurried and pumped to the main salt filtration plant for the production of saleable unstoved salt.



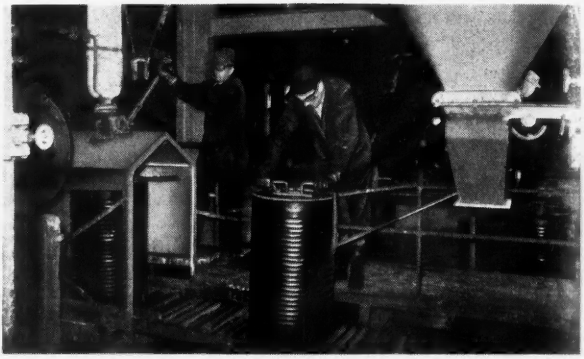
Two-stage, double-acting, reciprocating chlorine compressor

The concentrated alkali from the double-effect evaporator passes on to the single-effect evaporator, where further salt is removed in a settling vessel. The liquor passes on through a cascade cooler, the first seven troughs of which are cooled by water and the rest by low temperature



Rotary drying kilns extract further moisture to produce "stoved vacuum salt"

brine. When it is cooled, the 50 per cent caustic is pumped through a rotary leaf pressure filter to remove salt precipitated in the coolers. The filtered solution then goes to storage to await despatch or for further evaporation to anhydrous caustic soda in the 100 per cent caustic plant. "Dowtherm" vapour is used as the heating medium for this purpose.



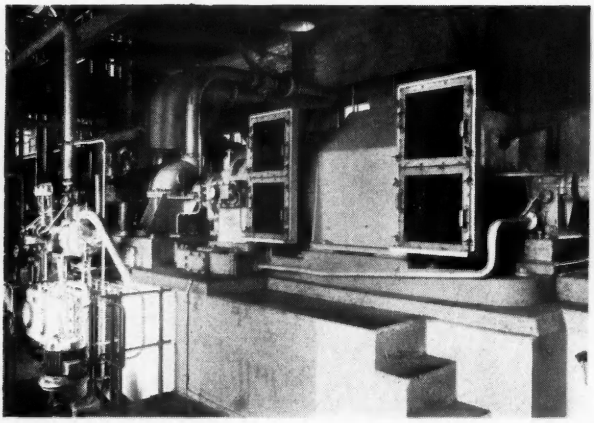
Packing molten caustic soda into drums

The chlorine produced in the Hooker cells, being saturated with water vapour, is partially dried in a battery of chilled water coolers. The remaining moisture is virtually all removed by passing the gas through three drying towers irrigated with concentrated sulphuric acid.

The dry chlorine is then boosted to a ring main distribution system whence it is distributed to various plants for further treatment. That required for liquefaction is taken through a two-stage compressor leaving the high pressure side at about 100 lb/sq in, at which pressure it liquefies when cooled to about 20 deg C (compared with — 33 deg C at atmospheric pressure). The compressed gas is cooled by passage through vertical shell-and-tube heat exchangers using water and refrigerated brine as cooling agents. The liquefied chlorine goes through weigh tanks to three storage tanks with a capacity of 80 tons. Only 80–90 per cent of the input gas is liquefied, the remainder being either burnt with hydrogen (from the cells) to produce hydrochloric acid, or combined with diluted caustic soda in absorbers to form sodium hypochlorite.

From the above description of the processes employed it will be gathered that the primary salt production calls for a considerable amount of steam but comparatively little electricity. It was this fact that was largely responsible for the company's decision to extend the scheme to cover other products requiring for their manufacture large quantities of electric power. The choice of the diaphragm type electrolytic cell was also, to some extent, determined by the desire to utilize substantial quantities of pass-out steam.

The a.c. generating plant, with pass-out turbine



All the process steam used is at low pressure (15 lb/sq in),

The control panel for the a.c. supplies

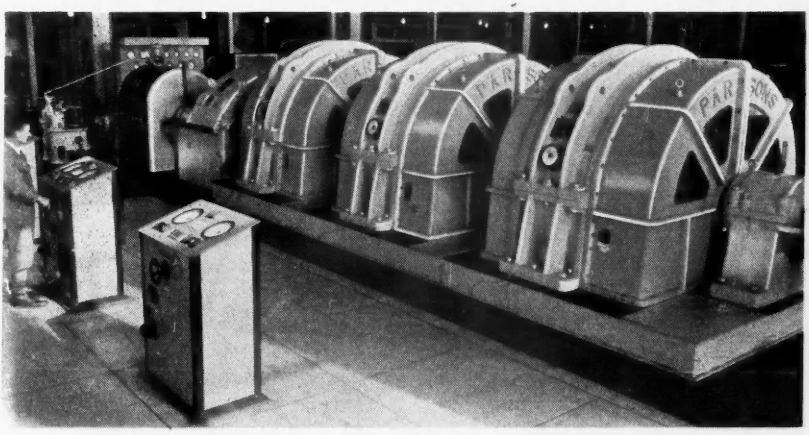
the high pressure steam from the two Thompson 70,000 lb/hr coal-fired boilers being first utilized by two pass-out turbines generating d.c. for the cells and a.c. for motors and lighting respectively. The boilers are equipped both with Howden "Turbovane" forced draught (30 h.p. motors) and induced draught fans (93 h.p. motors), secondary air being provided by basement fans (26 h.p. motors). The grate speed of the carrier bar stokers is controlled by adjustable speed motors.

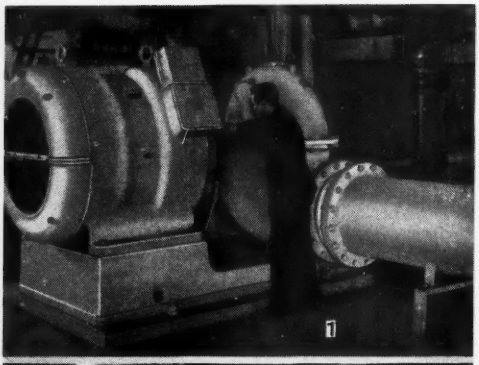
Fan motors employed in the boiler plant are equipped with interlocked remote control from the main operating control station. These instrument panels at the control station also incorporate steam flow indicating and recording meters, draught, pressure and temperature gauges and Igema water level indicators.

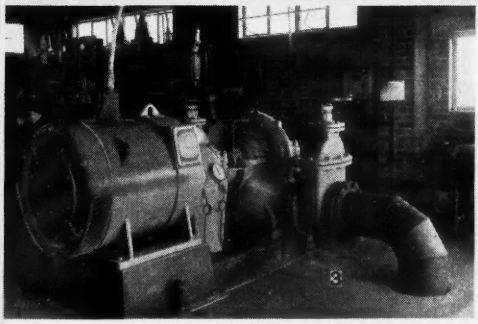
The d.c. plant (Parsons) comprises a two cylinder pass-out turbine driving three geared generators, the turbine spindle running at 4,500 r.p.m. The unit is designed to generate 60 per cent of its full output without any pass-out. Its Electroflo instrument panel comprises indicating, recording and integrating flow meters on h.p. and pass-out steam, steam and oil pressure gauges, a Grubb-Parsons absolute pressure gauge and a system of illuminated pilot lights. An Elliott recording instrument also shows simultaneously the high pressure and pass-out steam pressures and temperature, volts and amps. Audible warning is given by Klaxon alarms in the event of the generator, oil, or oil cooling water temperatures exceeding a predetermined maximum.

The three d.c. generators, which are

The d.c. generating plant showing separate control desks for the three geared generators







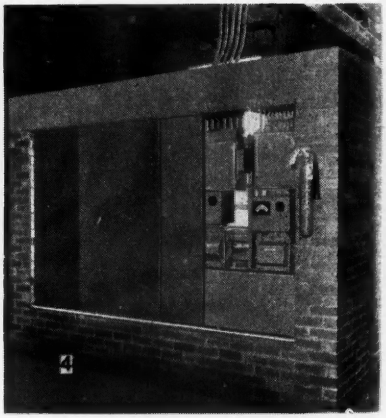
(1) Cooling water circulating pump driven by a 165 h.p. motor. (2) Brookhirst control gear for the water pumping plant. (3) Gwynne process water pump and switchboard in the pump house. (4) As a protection against splashing, the distribution board in the salt evaporation plant is housed in a brick cubicle with steel doors. (5) Distribution panel for the 50 per cent caustic plant. (6) Remote motor starter panel for the caustic plant

employed instead of a single unit so as to reduce current density in the commutators. are shunt wound self-excited machines with compensated windings. Separate control desks are provided for each, with Whipp & Bourne air break circuit breakers mounted in a gallery below. Provision is made for paralleling the three generators, the summated output being shown on a separate panel. A " Sirocco " fan ventilates the closed circuit of the generators, which is also surface cooled by circulating water.

Normal operation of the circuit breakers is effected by means of 220 V d.c. obtained from the a.c. mains through a Westinghouse rectifier. An emergency tripping circuit connected to push-buttons at various points in the process shops (notably the cell room and the chlorine liquefaction plant) is, however, operated by a 36 V Exide battery fitted with Crypton charger.

A.c. is produced by the Belliss & Morcom pass-out turbine with a David Brown gear box reducing the speed from 6,500 r.p.m. on the spindle to 1,500 r.p.m. on the Mather & Platt alternator. Although this unit is sufficient to supply all the a.c. needs of the plant, a 1,500 kVA standby supply is available from the Merseyside and North Wales Electricity Board, this being stepped down from 33 kV to 415 V by means of a Parsons oil immersed outdoor type transformer.

The Reyrolle main switchboard is arranged with a centre section switch on each side of which are the switch panels for the alternator and the Electricity Board



supplies. As only one 3,000 A main circuit breaker is provided, the changeover from one source of supply to the other involves a shut-down and the transfer of the circuit breaker between the two panels, making it impossible to parallel. Synchronizing gear is, however, being provided in preparation for short-period paralleling when it is necessary to change from one supply to the other. Twelve other panels on each half of the board cover the works feeders (8), the power house (2) and two spares. At one end of the board there are a "Metrovick" automatic voltage regulator and excitation panels for the alternator. Overload and earth leakage protection is provided on the feeders with Merz-Price protection on the alternator and overload protection only on the Board's supply.

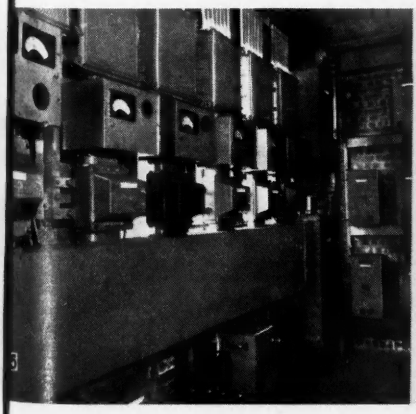
Cooling water requirements both for the generating plant and the process work are catered for by a pumphouse and a 140ft high concrete cooling tower at one end of the factory site. A 7,200 gall/min Parsons circulating pump driven by a 165 h.p. motor with Contactor Switchgear control gear serves the generating plant. Process water is supplied through a pipeline by one of two 3,600 gall/min Gwynne pumps (125 h.p.), while the return process cooling water is handled by one of two 3,600 gall/min Gwynne pumps (95 h.p.) controlled by floats in the process water return sump. The effluent is returned to the canal. As a flood precaution one 25 h.p. and two 100 h.p. Gwynne vertical spindle pumps have also been provided.

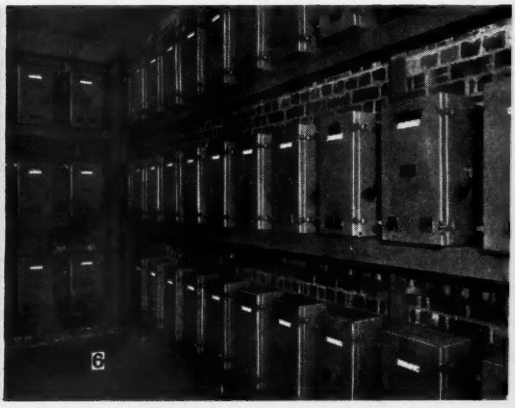
In the compressor house the plant includes two Alley & MacLellan dry carbon ring chlorine compressors driven by 150 h.p. Metrovick motors and speed controllers. Three Laurence, Scott 40 h.p. motors are also provided for driving three Sterne ammonia compressors in the refrigeration plant.

Except when otherwise mentioned, nearly all the motors used are of Laurence, Scott manufacture. The majority of motors are arranged for direct-on-line starting, the starters (mainly Contactor, Ellison and Brookhirst) being grouped in special rooms out of reach of corrosive chemicals and fumes. Similar protection is given to the local switch and fusegear and distribution boards in situations where chemical attack may occur, brick cubicles with steel doors being employed to give protection against splashing in other cases. The Cooke & Ferguson sub-circuit breakers are all arranged on a 0·3 sq in ring main, the Parmiter, Hope & Sugden "Aeroflex" switch-fuses all being fitted with h.r.c. cartridge fuses. Emergency battery lighting (24 V) worked from a "Davenset" trickle charger is provided.

A further centre of electrical interest is the factory kitchen which is equipped with a Jackson cooker, hotplates and proving oven, a Carowe fish fryer, a Tweedy potato peeler, a Peerless mixer and a "Sternette" refrigerator.

Mr. L. C. Grant (Sloan & Lloyd Barnes, Liverpool) was the consultant for the whole project, including the electrical installation.





Electrical Research

Reports on Work of the E.R.A.

A NUMBER of research reports have recently been made available by the British Electrical and Allied Industries Research Association and these are obtainable, at the prices indicated in parenthesis below, on application to the Association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

In Report Ref. Q/T 104, which was published some time ago, the design of capacitor-transformers for the special purpose of taking comparatively small amounts of power from h.v. lines was investigated. This study, however, was not wide enough as it did not cover instrument transformers in which great accuracy in voltage drop, in phase angle difference between the primary and secondary voltages, and in the influence of a deviation in the supply frequency are required. Report Ref. Q/T 122, by S. Silbermann, "The Design of Capacitor-Transformers" (24s) deals with the theory of such capacitor-transformers and with the application of the developed formulæ to the practical design.

Network Analyser

The results contained in Report Ref. G/T 264, "Network Analyser of Inherent Restriking Voltage Transients on the British 132 kV Grid," by L. Gosland and J. S. Vosper (10s), have been obtained by means of the E.R.A.'s multi-frequency network analyser and so far three substations have been considered. For each transient the rate of rise of voltage and the amplitude factor have been determined. An indication is also given of the probable effect of the addition of the proposed 275 kV network.

The measurement of copper losses in transformers of small and medium sizes is relatively simple, but in reactors and very large transformers difficulties are caused by the very low power factor. Report Ref. Q/T 129, "The Measurement of Copper Losses in Transformers and Reactors," by M. Waters (12s), which has just been published, discusses the problem in some detail and presents a critical review of the available methods of measurement.

A description of a further investigation of the simplified electrically-heated hotbed to determine the optimum dosage and planting date is given in Report Ref. W/T 24, "Electrical Soil Warming for Salad Crops in Frames," by A. E. Canham (9s). Recommendations are made for its use both by amateur gardeners and commercial growers.

A questionnaire was recently circulated to a number of users of pulverized fuel grinding plant and the replies have now been analysed in Report Ref. P/T 105, "Commercial Pulverizing Experiences" (15s). This report gives a general picture of present pulverizing practice and indicates several important lines of research being carried out in collaboration with the British Coal Utilization Research Association.

The measurements described in Report Ref. L/I 255, "Excitation Temperatures of Hydrogen Arcs," by H. Edels and J. D. Craggs (12s) were undertaken as part of a larger programme of work on the d.c. hydrogen arc which is partly intended to show by means of measurements of excitation, electrons, and gas temperatures on the same type of arc how nearly the state of thermal equilibrium is approached. The data are also of interest for other reasons, e.g., because excitation processes in high pressure discharges have seldom been studied in detail.

Threading Dies

A 48-page edition of "The Identification of Threading Dies" is now available from W. H. A. Robertson & Co., Ltd., of Lynton Works, Bedford, manufacturers of the "Wharco" range of dies. The booklet now includes thread rolling dies, which have been added to their products, and identifies some 300 chaser dies with over 100 full illustrations. It also includes details of 60 different series of the principal screw thread systems of the world. Complimentary copies will be sent on request.

Railway Batteries

Signal and Telecommunication Requirements for India

By H. C. TOWERS

WITH few exceptions, a.c. power is used for all general purposes. The ease with which voltage can be stepped up and down, by static appliances, enables power to be supplied over great distances with minimum losses. However, there are many cases where d.c. power only is suitable and this is particularly so in some signal and telecommunication circuits.

Accepted features of modern signalling systems are the colour light signal and the a.c. track circuit. In isolated districts where power supply is not available, energy must be derived from primary or secondary batteries; d.c. is also more acceptable for the operation of electro-magnetic appliances. The a.c. electro-magnet is a difficult piece of apparatus compared with its d.c. counterpart. The winding has a large inductance, a much higher operating voltage is required and, if not carefully designed, the magnet can be noisy and will overheat. Telegraph morse sounders, telephones and other similar apparatus require d.c. for their operation.

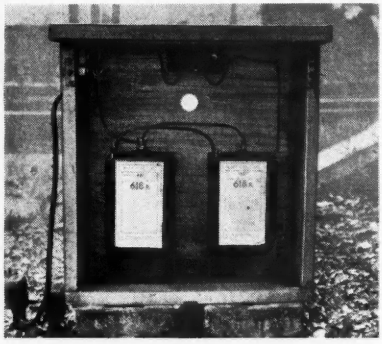
Excluding the earlier types of primary cells, the Leclanché is probably the most popular cell for group telephone circuits, telegraph mains, signal repeater circuits, etc. The original design consisted of a zinc rod and porous pot in an electrolyte of salammoniac; manganese dioxide was used as the depolarizing agent in the pot. The cell was improved by Le Carbone, Ltd., as seen in their "AD" 230, 236 and 245 types; the porous pot is replaced by a carbon block and the zinc rod by a zinc cylinder which almost surrounds the carbon. This is porous and being of special construction it remains quite dry when partially immersed in the electrolyte. The gases generated by the action of the cell circulate freely in the pores and there the hydrogen is combined with the oxygen of the air through the special property of the cell. From this fact is derived the term "AD" (air depolarizer).

This type of cell works well even under casual maintenance, but is not of pleasing appearance in such circumstances. Careless placing of the carbons in the electrolyte promotes salt creep and too strong a solution causes the inside of the jar to be crusted. The changing of electrolyte and the cleaning of the elements is a messy business and for this reason the batteries should be placed as far away from office accommodation as possible.

In early installations the usual method was to cram as many of these cells as possible into a small cupboard which would be placed in some inaccessible spot in a station office or underneath a signal cabin. In the latter case mechanical operation of points and signals is generally in use so that access to the batteries is through a difficult forest of down rods, wires and hanging weights. Battery cupboards also have a habit of growing as other circuits are installed. A heterogeneous collection of assorted shapes and sizes is the result.

Standard practice introduced by the writer on his railway (the Western Railway of India) is to place all batteries outside the signal cabin or station office. Usually brick cubicles, rendered with a cement facing, are used and fitted with large doors

Battery box in India showing Leclanché cells with terminals and cable terminations



Track circuit feed box (at Winchfield, Hants) containing two "AD" 618 A cells in parallel, showing position of resistance relative to upper ventilation hole

so that all the cells are immediately visible. The cells are evenly spaced on shelves by means of wooden spacers and there is a serial number on each jar. The names of the circuits served by the various cells are painted on the edges of the shelves. The circuits are not connected directly to the cells, but terminate in disconnecting strips mounted on porcelain blocks. Often the cells are connected in parallel so that one group can be removed for cleaning while the balance is still available for working the circuit.

In telegraph offices there are often several hundred cells in use. On the writer's railway, in days gone by, they were placed on open racks, crowded together and several deep so that those inside could not be inspected. In a country like India, dust collected on them rapidly, as well as old files, books and other office junk deposited by the telegraph operators. When the Signal Department took over from the Electrical Department the system was abolished and replaced by the method previously described.

Experience has shown that where cells are readily accessible, staff take more pride and interest in them. At important junction stations, where several telegraph mains and inter-wires terminate, five or six hundred cells may be in use. In such cases a special battery room is arranged with teak shelves around three sides of the room. The cells are uniformly spaced with a single line to each shelf. Terminal blocks are used as in the case of cubicles for linking the various groups and the wiring of the entire installation is taken to a glass fronted terminal box, using the same type of terminals. A wiring diagram book and chart are placed on a desk underneath and a small sink and tap provided for cell washing.

Where a fairly reliable supply of electricity is available the latest practice in large telegraph offices is to use secondary batteries on trickle charge through a rectifier charging unit. Should the supply fail temporarily the cells would still be available for operation. The Exide DFG-type of cell is in general use for this work.

On the Western Railway most of the main line is single track, except for 25 miles of quadruple track in Bombay and some 250 miles of double track from Bombay to Baroda. The crossing stations on the single line have loops some 1,800 to 2,000ft long. The signals are operated from an elevated lever frame on the station platform. Points are fitted with full mechanical interlocking equipment operated from small ground frames at site. The various functions are interlocked with each other electrically through an electric slide control in the station office under the immediate supervision of the stationmaster. It is therefore impossible for any conflicting route to be set up, or wrong signal given. A pole route runs from the station office to the ground frames for connecting up the various electrical contacts and other features. Three batteries are used, one in the station office and one at each ground frame.

Central Battery Operation

In the hot season the battery cupboards at the ground frames are too hot to touch. Although the cupboards are adequately ventilated, the very high temperature inside them causes the electrolyte to evaporate rapidly, calling for more intensive maintenance with consequent increased expense for stores, travelling allowance, etc. Central battery operation is now being adopted at all these stations and the batteries at the ground frames are being removed. The station offices are built of stone and are cool in the hottest weather. The supply of energy to the ground frame circuits is by means of an additional wire on the pole route from the station battery. Insulated wire is used to prevent the possibility of false indications occurring due to pieces of wire being dropped across

the lines by birds. The other wires are bare No. 10 s.w.g. g.i.

During the war large supplies of an American soda cell were received under Lease-Lend arrangements. Apart from the disadvantages of increased size and slightly lower voltage per cell, which necessitated alterations to battery cupboards, they were found very efficient. This type of cell is no longer available and this difficulty was experienced by the Southern Railway of England as far back as 1947.

That railway gradually converted all its circuits from soda cells to "AD" 618 A and "AD" 513 for track circuits and electric signal machines respectively. These are also air depolarizer cells with carbon and zinc electrodes and caustic soda electrolyte. The cell is supplied dry and inert and is brought into action by the addition of a little water poured into a filler hole at the side. One of the advantages of this type of cell is that it can be brought into use within a few moments whereas it took hours to set up the old type of soda cell, wait for the electrolyte to cool, etc. On the Western Railway it has been decided to introduce the "AD" 619 A cell for central battery operation which is of the same type as the 618 A and 513 and is a 1,000 W/hr cell with a minimum e.m.f. of 1·4 V. Once installed in the station office, no subsequent maintenance is required except occasional voltage readings. As the cells will be in operation on intermittent circuits it is expected that their life will exceed a year and possibly extend to two.

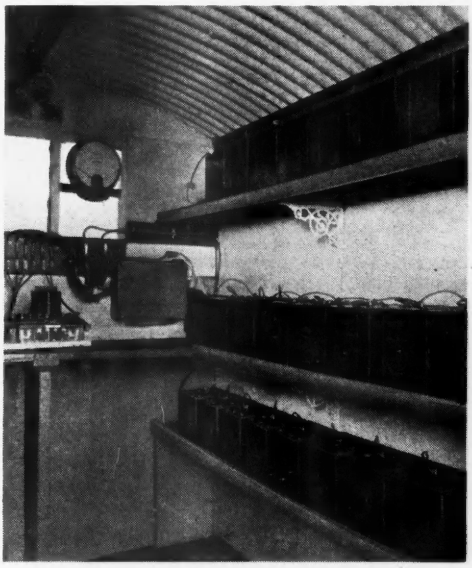
The Western Railway is also experimenting with permanent electric lighting of signals. At some stations the outermost signals are situated in lonely places frequented by wild animals. If a signal lamp goes out at night the traffic porters are naturally reluctant to invite the attention of a prowling panther or tiger. A permanently lit electric signal is ideal for such situations: having no switch, there is no danger of the signal light not being switched on while the battery is placed high up the post to prevent unauthorized interference by curious persons. The "AD" 618 A cells were used in two experimental cases and energized a 3·6 V 0·8 W tubular lamp, like that used on the French National Railways. It was obtained for the writer through Le Carbone, Ltd. The lamps were permanently illuminated and the batteries had a life of five months.

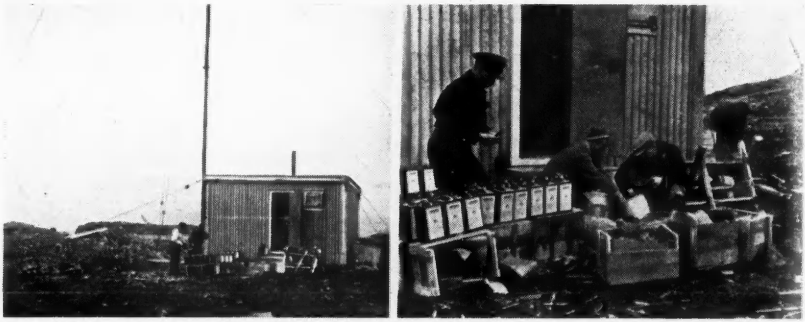
Operation of Points

In power signal schemes, where points are worked by all-electric machines, a.c. is mostly used on account of its flexibility. In the event of the power supply failing the whole installation will shut down. Special rules are in operation for dealing with such contingencies and provide for piloting trains past colour light signals which have gone out. The points, however, have to be moved and for this purpose a special crank handle is provided which, when inserted into the point machine, enables the mechanism to be worked by hand. This handle can only be used on one pair of points at a time so that when several have to be worked there is considerable delay.

The d.c. operation of point machines from batteries on trickle charge, or primary

Battery of thirty-three "AD" 513 cells installed May, 1950, for operating points motor, 4 A, 39 V, at Stenson Junction, near Derby





Hut and base of radio mast at Fuglehuken showing cells being filled with small quantity of water when renewing batteries

batteries, of the " AD " type means that the points can always be worked from the power frame even though the electricity supply has been interrupted. The indication locks on the point levers would also have to be fed from the same source where locks are in use. Heavy duty " AD " cells are also suitable for point operation at stations where an electricity supply is not available and this method is extensively used on British Railways. The " AD " cells are also in use for navigational purposes such as flashing lights and radio signals. Some of these batteries are placed in almost inaccessible positions where inspection during the life of the battery is almost impossible. An installation of this type is situated at Fuglehuken, in Spitsbergen at 78 deg 55 min N and 10 deg E. The battery consists of 55 " AD " 619 A cells arranged in five parallel groups of 11 each. It energizes radio apparatus which operates continuously, sending out the signal " FG " in morse for one minute followed by three minutes' silence. The drain on the battery varies between the normal minimum of 100 mA and a maximum of 1 A at the time the signal is being sent out. The station is completely unattended and is visited only once a year in July when the cells are changed and the apparatus is attended to.

American "Defence" Report

SURVEYING the electric power situation in the United States the Director of Defense Mobilization in his sixth quarterly report to the President says that it now appears as though only about 7·1 million kW of new generating plant of the 9 million kW contemplated will be installed this year. He attributes this primarily to delays in the delivery of plant, particularly turbines and boilers. The deficit of about 2 million kW may be partially offset by a lower peak demand during the coming winter than had previously been forecast. Even so, capacity will be inadequate in several regions, particularly the Pacific North-West and the Southern States from Texas to the Atlantic. In the Pacific North-West the estimated loads for 1952 and 1953 are greater than the expected generating capacities even under average conditions of water supply. If this supply is below average drastic curtailment will be necessary, involving a substantial loss of aluminium production.

The largest Government-assisted power scheme is that covering a 400 MW plant being built on the Muskingum River in Ohio, at an estimated cost of over $55 million. When it is placed in service in mid-1953 this installation will provide additional power for important defence industries, including those producing ferro-alloys, steel, chemicals and electronic apparatus.

In another section of the report the Director says that about 150,000 workers were stood off in plants experiencing a shortage of steel. Among the industries which have been seriously affected are automobile assembly, electrical machinery, electrical appliances, and iron and steel foundries.

VIEWS on the NEWS

By REFLECTOR

LORD Swinton has suggested that there should be " league tables " to stimulate rivalry between British manufacturers in the export field. Presumably their names would appear in an order determined by the value of their exports. As this would favour the larger firms, however, arrangement according to the proportion of their output exported would be fairer. But the employees would take an interest in these " league tables " only if some sort of " pools " system were devised.

* * *

If the Greeks had no word for it somebody is bound to suggest one which they ought to have had. My latest discovery in this field is " psychromatics " which appears in the heading of an article in the *Municipal Journal* — " Psychromatics Applied to Schools." No doubt it meets a long-felt want for it is shorthand for

> " the scientific application of colour and illumination to building interiors so as to ensure maximum ease of visibility, a visual environment best suited to the interior and its purpose, and the mental and physical well-being of its occupants."

The Lighting Service Bureau has done work in this sphere but apparently was not aware that it was engaging in psychromatics.

* * *

One demand put forward at a meeting of the recently-formed Bournemouth and Poole Gas and Electricity Consumers' Association was that no increase should be made in electricity prices until it was shown to be in the public's interest. Does this mean that the public must be convinced that an increase is in their interest? If it does, the Southern Electricity Board's prices are likely to remain unaltered—unless, of course, it decides to reduce them. Anybody could get the consumers to believe that a *downward* movement was in their interest. At the same meeting a member expressed regret that nothing had been said about gas. *The Bournemouth Times & Directory*, from which I have quoted, says that it was decided to leave that over until the next meeting. Electricity always takes precedence in the matter of complaints.

* * *

Small explosions in the vicinity of electrical appliances were reported recently by a West Hartlepool householder (Mr. L. H. Bulmer) but police and officials of the North Eastern Electricity Board failed to find anything to explain them. After the explosions black powder was found in the kitchen. One of the Board officials is reported by the *Northern Echo* to have said that when Mr. Bulmer put his hand on a kettle there was " quite a loud bang, like a small firework." When, however, one of the Board's men handled the kettle nothing happened. The official did not agree that the incidents were " an electrical fantasy " as Mr. Bulmer described it. My theory is that the trouble was caused by a gas-minded poltergeist.

* * *

The *News Chronicle* reports that a new safe-cutting device " which works by electricity " was left by burglars at the Burton whist-drive hall. The *Electrical Review* Information Department tells me it has not yet had any requests for details or been asked where the device can be obtained.

* * *

I quote, without expressing any opinion about its authenticity, the following note which appeared recently in *Punch*:—

> " A spokesman of the British Electricity Authority has assured us that the projected exchange of electrical facilities between this country and the Continent doesn't mean that the lights will be going out all over Europe."

* * *

Advertised in *Electron* (the E.T.U. journal):—" Bovine water turbine, generator, oil pressure governor and switchboard." The ox-power is not given.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Iraq Petroleum Co., Ltd., has appointed **Mr. A. G. Coates**, M.I.E.E., A.M.I.Mech.E., superintendent of communications. Previously deputy engineer-in-chief, Palestine Posts & Telegraphs, and chief engineer, Iraq Posts & Telegraphs, Mr. Coates has been with the I.P.C. for the last four years.

Mr. E. F. Bacon, Holmfirth District manager in the No. 2 Sub-Area of the Yorkshire Electricity Board, retired on 23rd August having reached the age of sixty-five.

Mr. E. F. Bacon

Mr. Bacon was educated at the New College, Harrogate, and Yorkshire College, Leeds (now the University). He began work as a student in the City of Leeds Electricity Department, where he remained for eleven years. Subsequently for about six years he was chief electrical engineer to the United Premier Oil combine, Hull, and for a further six years was commercial manager in the Colchester Electricity Department. In May, 1933, Mr. Bacon was appointed engineer and manager of the Holmfirth Urban District Council's electricity undertaking, and on the nationalization of the industry he became manager for the Holmfirth District. His position at Holmfirth is not to be filled; the Holmfirth office will be controlled from Huddersfield.

Mr. John Walsh, of John Walsh (Electreliance), Ltd., Blackburn, has completed fifty years in the electrical engineering industry. He celebrated his jubilee last week by entertaining his employees to a dinner. Each member of the staff received a gift. On behalf of the staff, Mr. J. H. Dobson (director) presented Mr. Walsh with a silver flask. Mr. Walsh converted his business into a private limited liability company in 1947, and several of his staff who have been with him for more than thirty years have become shareholders. Two were appointed directors this year. Mr. Walsh was a founder member of the Blackburn branch of the Electrical Contractors' Association and was chairman for seventeen years. He has been a member of the national council and of the executive of the E.C.A. for many years and was vice-president for three years.

Mr. L. R. Slinn, A.M.I.E.E., A.M.C.T., first assistant to the commercial officer, Wallasey District, Merseyside and North Wales Electricity Board, has been appointed commercial engineer for the Purley District of the South Eastern Electricity Board.

Mr. G. R. Stone, who was elected president of the Birmingham Electric Club for the 1952-53 session last March, has accepted a business appointment in California and will therefore not be able to take office. **Mr. H. M. Barker** has been transferred to Hebburn by his firm and will therefore not be able to take office as assistant social secretary.

Mr. G. F. Peirson has been nominated as president for the session, and **Mr. J. R. Anderson** as assistant social secretary. These nominations will be put to the members for approval at an extraordinary general meeting on 15th September. The general meetings for the 1952-53 session are to be held in the Midland Hotel.

The Plessey Co., Ltd., announces that **Mr. J. Foster Veevers**, M.I.E.E., M.I.P.E., M.I.I.A., has been appointed general manager of the Swindon works. Before joining the Plessey Co., Mr. Foster Veevers was with the General Electric Co., Ltd., as manager of the Stockport works of Salford Electrical Instruments, Ltd.

Mr. J. Foster Veevers

Mr. A. R. Northover, the resident director and manager of the Merthyr Tydfil factory of Hoover (Washing Machines), Ltd., and the subsidiary factories at Cyfarthfa and Aberdare, will be assisted in his added responsibilities by the appointment of a works manager. **Mr. F. Austin**, at present works manager of the Hoover factory at High Wycombe, Bucks, will, on 1st September, move to Merthyr where he has been promoted to the position of works manager. **Mr. T. Hallifax**, hitherto production engineering

superintendent at High Wycombe, will take charge of the High Wycombe factory on 1st September.

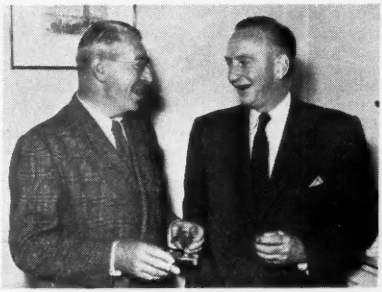
Mr. A. H. Bull, export manager of Oldham & Son, Ltd., left London for Bombay last Monday for a three months' business tour of India and Pakistan. While in India, Mr. Bull will visit the Madras factory of his company's associate, Oldham & Son (India), Ltd.

Mr. E. Gray, of E. K. Cole, Ltd., Plastics Division commercial staff, has been appointed to the Export Sales Department, where he will concentrate on plastics exports under Mr. W. W. Syrett, radio and plastics export sales manager. Mr. Gray was assistant buyer for Ekco from 1941 to 1945, and rejoined the company in December, 1948.

Crypto, Ltd., London, announces that **Mr. C. S. Jordan** has been appointed manager of its Birmingham branch which controls sales and service throughout the West Midlands area. Mr. Jordan, who joined Crypto in September, 1949, has been general sales division representative for Hampshire.

Mr. R. A. S. Richardson has been appointed technical sales representative of M.T.E. Control Gear, Ltd., for Southern England, including Greater London. Mr. Richardson has specialized in the field of electrical control equipment for a considerable period of his career. After service during the war with the Royal Fusiliers and R.E.M.E., he held the position of switchgear engineer on the sales staff of the British Thermostat Co., Ltd., and an executive position on the engineering staff of Dewhurst & Partner, Ltd.

On 14th August members of the Council of the Electrical Wholesalers' Federation entertained **Mr. and Mrs. W. G. Peirce,** of Philadelphia, at a luncheon at the Connaught Hotel, London, W.1. Mr. Peirce, of Peirce-Phelps Incorporated, is the immediate past president of the American counterpart of the E.W.F., the National Association of Electrical Distributors, and after a tour of the Continent he was in England for a few days to study methods of electrical wholesaling in this country. Several individual members entertained him during his stay, and he was able to visit the offices of two prominent London members and study their systems of mechanized accounting in which he is particularly interested.



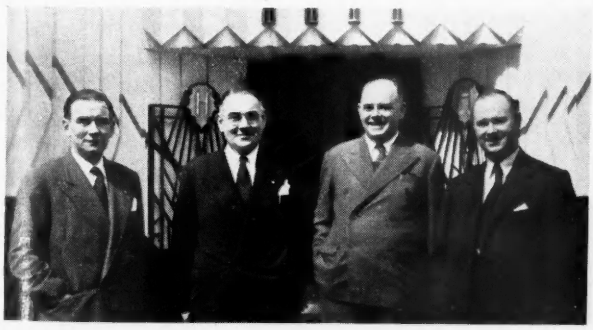
Mr. H. Riley, president, Electrical Wholesalers' Federation, and Mr. W. G. Peirce, of Philadelphia

Mr. H. R. Bowen, formerly managing director of E.M.I. Factories, Ltd., has been appointed managing director of the Britannia Electric Cable & Construction Co., Ltd.

Mr. E. G. Rowledge, director and manager of the Prestcold Refrigeration Division of the Pressed Steel Co., Ltd., left London Airport on 17th August for Africa.

Mr. H. E. Duggans, Far Eastern and Central American divisional export manager for Hoover, Ltd., is due to leave to-day (Friday) by air for Japan, Hong Kong, Siam and Burma.

A recent visitor to the Perivale factory of Hoover, Ltd., was **Mr. F. W. Cave,** managing director of F. W. Cave & Co., Ltd., Auckland, New Zealand, who are responsible for the distribution in New Zealand of Hoover f.h.p. motors. Mr. Cave is on a business tour to, among other countries, Britain, Canada and the United States, where he will see principals of manufacturing businesses for which he acts as representative in his country. In the accompanying picture are



Messrs. V. C. Mumford, C. H. Crowlie, F. W. Cave and G. S. MacNamara

Messrs. V. C. Mumford, export manager, Hoover, Ltd., C. H. Crowlie, export sales manager, Hoover, Ltd., and director, Hoover (Washing Machines), Ltd., F. W. Cave and G. S. MacNamara, export divisional manager, Associated Companies' Division, Hoover, Ltd.

Six hundred people took part in the recent annual outing of the sports club of **Santon, Ltd.,** Newport, Mon, when a specially chartered steamship, the *Glengower,* took the party to Ilfracombe.

It is reported that **Mr. Richard N. Berry,** M.I.E.E., system design and development engineer with the British Electricity Authority, is missing, presumed drowned, while on holiday at Mundesley, Norfolk. Mr. Berry's daughter got into difficulties while bathing and a Mrs. Meszaras went to her assistance. The girl was saved but Mr. Berry, who went back into the sea to help Mrs. Meszaras, did not return.

OBITUARY

Mr. James F. Urquhart, deputy manager of the South Caledonia Area of the North of Scotland Hydro-Electric Board, died recently at the age of forty-eight. Mr. Urquhart was educated at Heriot-Watt College, Edinburgh, and joined the Southern Scottish Electric Co. in the Berwick-on-Tweed district. In 1939 he joined the Perth Corporation Electricity Department as mains superintendent. On nationalization, Mr. Urquhart was transferred to Inverness as Sub-Area manager, but he returned to Perth last year as deputy manager.

Mrs. V. A. Pask.—We extend our sympathy to Mr. V. A. Pask, chief engineer to the British Electricity Authority, in the loss of his wife, Mrs. Nancy Ellen Pask, who died on 19th August.

WILLS

Mr. George Barnard, M.I.E.E., for 60 years with Callender's Cable & Construction Co., Ltd., and British Insulated Callender's Cables, Ltd., who died on 7th February, aged 89 years, left £17,794 gross (£17,654 net). His bequests included gifts to the E.I.B.A., the I.E.E. Benevolent Fund and the B.I.C.C. pension fund.

Mr. R. B. Hague, managing director and founder of Hague & McKenzie, Ltd., who died on 19th April, left £8,800 gross (£7,860 net).

Mr. J. Jones, founder and chairman of J. Jones & Co. (Nottingham), Ltd., electrical engineers, who died on 15th April last, left £13,926 gross (£13,777 net).

Mr. C. A. Robinson, late general manager of the Bombay Telephone Co., Ltd., who died on 3rd March last, left £19,739 gross (£19,362 net).

Lake District Extensions

IN the August "News Letter" of the Friends of the Lake District reference is made to the withdrawal by the North Western Electricity Board of a scheme for an overhead line supply in the Langdale district on the ground that restrictions on materials and labour would prevent its undertaking any scheme at present. The hope is expressed that such restrictions will not continue as a permanent feature of the national scene but it is said that "whilst they persist the position obtains that when a planning authority, in the course of discharging its duty to preserve, so far as may be, the amenities of its landscape, makes any representations as to certain portions of a new electricity line being placed underground, the Electricity Boards . . . are apt to abandon the scheme altogether, on the plea that capital restrictions will prevent its execution."

The "News Letter" also regrets that the Ministry of Fuel and Power approved a scheme for a supply in the Martindale district by overhead line, although the society is hoping to arrange with the Electricity Board some alteration of route to make the poles less conspicuous.

Contract Price Formulæ

THE British Electrical and Allied Manufacturers' Association has issued the August figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 16th August is deemed to be 134s. The "cost of material" figures are as follows:—

For electrical machinery and equipment: The Board of Trade index figure published on 16th August is 170·7.

For turbo-generating and allied plant: Materials used in mechanical engineering industries, 152·8; blast furnaces and iron and steel melting and rolling (40 and 41), 142·6; price of $\frac{3}{8}$in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin,* 22nd August), 3s 9$\frac{3}{8}$d.

Outstanding contracts covered by the Board of Trade intermediate products index: The index figure for intermediate products (16th August) is 363·9.

New Zealand Import Licensing

The *Board of Trade Journal* for 23rd August contains schedules of the goods subject to (or exempt from) licences upon importation into New Zealand during 1953. It includes many electrical classes. The arrangements follow much the same lines as for 1952; there are no major changes.

ELECTRICITY SALES IN JULY

IN our issue of 15th August we published the first analysis of electricity sales by the fourteen Electricity Boards and the British Electricity Authority. These were the figures for June: now with commendable promptitude the B.E.A. has issued the July statistics. These should be read in conjunction with the Ministry of Fuel and Power statement of electricity generated in July which was reproduced in last week's issue.

ELECTRICITY SENT OUT BY AREA BOARDS TO CONSUMERS

Area Board	Totals for July			Cumulative totals for four months, April-July			Totals for 12 months ended 31st July		
	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %
London	315	320	+ 1·6	1,503	1,417	− 5·7	5,264	5,213	− 1·0
South Eastern	185	198	+ 7·0	856	848	− 0·9	2,903	3,008	+ 3·6
Southern	214	231	+ 7·9	973	998	+ 2·6	3,278	3,475	+ 6·0
South Western	107	116	+ 8·4	493	490	− 0·6	1,663	1,685	+ 1·3
Eastern	305	319	+ 4·6	1,421	1,391	− 2·1	4,756	4,870	+ 2·4
East Midlands*	285	291	+ 2·1	1,271	1,238	− 2·6	4,123	4,206	+ 2·0
Midlands*	384	395	+ 2·9	1,724	1,710	− 0·8	5,608	5,763	+ 2·8
South Wales*	242	264	+ 9·1	980	1,053	+ 7·4	2,939	3,212	+ 9·3
Merseyside & N. Wales*	249	232	− 6·8	1,060	995	− 6·1	3,450	3,403	− 1·4
Yorkshire*	385	403	+ 4·7	1,677	1,680	+ 0·2	5,405	5,550	+ 2·7
North Eastern*	254	243	− 4·3	1,084	1,034	− 4·6	3,431	3,492	+ 1·8
North Western*	447	419	− 6·3	1,924	1,818	− 5·5	6,135	6,373	+ 3·9
South-East Scotland	72	74	+ 2·8	337	341	+ 1·2	1,154	1,193	+ 3·4
South-West Scotland	168	172	+ 2·4	826	812	− 1·7	2,847	2,884	+ 1·3
Total all Area Boards	3,612	3,677	+ 1·8	16,129	15,825	− 1·9	52,956	54,327	+ 2·6
Direct Sales by B.E.A.	57	60	+ 5·3	226	231	+ 2·2	704	715	+ 1·6
Grand Total	3,669	3,737	+ 1·9	16,355	16,056	− 1·8	53,660	55,042	+ 2·6
Mainly Industrial Areas*	2,246	2,247	+ 0·0	9,720	9,528	− 2·0	31,091	31,999	+ 2·9
Mainly Non-Industrial Areas	1,366	1,430	+ 4·7	6,409	6,297	− 1·7	21,865	22,328	+ 2·1

* Over half the sale of electricity by these Boards is to industrial consumers.

SOUND REPRODUCTION

ONE aspect of research on sound reproduction undertaken by the General Electric Co., Ltd., was demonstrated at its research laboratories prior to the opening on Tuesday of the National Radio and Television Exhibition. The facilities at Wembley permitted the expansion of the "three-dimensional" or "stereophonic" sound programme presented to the public at Earls Court in that both "live" and recorded transmissions were given on the multi-channel system.

The 30 W "high fidelity" amplifier employs over 20 db of negative feedback from a tertiary winding on the output transformer to the first stage of the main amplifier with negligible phase shift; overall distortion content is stated to be under 0·4 per cent. Each amplifier incorporates a pair of "Osram" KT 66 valves of the type now being exported in large numbers to the U.S.A. It is designed to give a response within a sound frequency range of 40–12,000 c/s with less than 0·4 per cent distortion at full output and for the loudspeaker a level response is obtainable over a similar range. This performance compares with the B.B.C. maximum of 9,000 c/s and many commercial records of 80–8,000 c/s. Normally, time control is required only to compensate for different volume levels or the acoustic properties of a room and to correct any non-linearity of frequency in recording; for this purpose a pre-amplifier section can be built into the main amplifier.

The anode dissipation of 25 W gives the valve a long life. A cathode consumption of 8 W yields a low running temperature which lessens the effect of high line voltages on emission characteristics. The screen is rated at 400 V. Valves may be used in pairs without matching and connected as triodes to give an output of 15 W with less than 0·1 per cent distortion. Multiple pairs may be connected as triodes or used as tetrodes for higher powers.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Regulation 404J

THE following query sent to the I.E.E. and which has been published may enlighten the darkness of Mr. E. H. Marshall (*Electrical Review*, 22nd August).

Q.: Does 404J require that a Bakelite ceiling rose shall be fitted with a Bakelite box to bring cables into the rose? It is usual to supply standard ceiling roses with knock-outs for entry.

Ans. by I.E.E.: The essential requirement of 404J is that cable from which the protective sheath has been removed shall be enclosed within a box, unless it is already enclosed by an accessory or lighting fitting. For surface wiring where the surroundings are incombustible, the base of the recess permitted for use in place of a box may be formed by the finished surface of the wall or ceiling. The front of the recess may be formed by the accessory itself. An incombustible pattrass block would not be ruled out if mounted on an incombustible surface.

It is my personal opinion that clarification of the majority of the I.E.E. Regulations for the Electrical Equipment of Buildings could be easily obtained by an example of the typical installation which complies and also the one which does not comply with the particular regulation.

Yes! the book would be much bigger, but look at Mr. Marshall's twenty years of darkness.

D. CLARK,
Sen. Elect. Engineer,
Ilford Borough Council.

Ilford.

Conferences

YOUR readers who are privileged to attend electrical and other conferences sometimes feel that not enough consideration is given to the selection of dates for the holding of conferences. The number of conferences is on the increase, which means that greater demands will be made on a number of popular seaside resorts. It would therefore seem advisable that some form of "clearing house" should be established.

Conferences are good and, properly organized, provide a link in industry that cannot be forged by any other means. It is suggested that it might be useful if all those responsible for their organization were to meet, when this, and many other relevant matters, could be discussed. The pooling of experiences should be of great value.

If there is sufficient support I would be willing to convene the first meeting.

J. W. SIMPSON,
Secretary, British Electrical Power Convention.

London, W.1.

Contracts and Sales

I SHOULD be obliged if you could allow me space to reply to questions raised by correspondents regarding the articles published under the above title in the 8th, 15th and 22nd August issues of the *Electrical Review*.

I must apologize for an error which has crept into the first article, "Formation of the Contract." In line 6 of the paragraph "Necessity for Writing" on page 298, the word "not" should be inserted between "it is" and "to be," so that the sentence reads "the first is when it is *not* to be performed within one year of its making."

Referring to the same page, under the heading "Void Contracts," I have been asked to expand the point that contracts purporting to exclude the jurisdiction of the Courts are void, and to explain the case of *Rose and Frank Co.* v. *J. R. Crompton and Brothers, Ltd.* (1925. Law Reports A.C. 445). That case affords an unusual instance of the effect of a clause which specifically creates a "gentleman's agreement." The facts were that the plaintiffs were dealers in carbon tissues, which the defendants manufactured. The agreement was for the supply of these over a certain period against specific orders by the plaintiff from time to time. Before the period had expired the defendants terminated the agreement without the requisite notice, and refused to execute orders already

received. The plaintiffs brought an action for damages for breach of the agreement and for non-fulfilment of their orders.

The claim for breach of agreement failed, because of the clause which excluded legal jurisdiction and defined the agreement as " only a definite expression and record of the purpose and intention of the parties concerned, to which they each honourably pledge themselves." But the other claim was successful, for the giving and acceptance of each individual order was held to constitute a fresh contract, unconnected with the original agreement, which, being unenforceable, placed no obligation upon the parties to give or accept such orders.

This situation is exceptional, however, and the more usual case is illustrated by *Jones* v. *Vernon's Pools, Ltd.* (1938. 2 *All England* Reports 626), where the plaintiff sued on a football-pool coupon, which, it was alleged, had been lost by the defendants. A clause printed on the coupon, providing that the transaction should " not be attended by or give rise to any legal relationship," was held sufficient to exclude action in the Courts.

A Scottish reader suggests that I should deal with the differences between English and Scottish law, but this it is almost impossible to do without rewriting the articles. The common law of England does not, of course, apply to Scotland, because Scottish law is based upon the old Roman or civil law, whereas English law is not. Though there are similarities, they must be regarded with caution, for any resemblance may be deceptive. However, the Sale of Goods Act, 1893, applies to Scotland as well as to England and Wales, with certain modifications in its application.

C. F. Mayson, A.M.I.E.E.

*Temple, London, E.C.*4.

Light Gauge Conduit

IF you could spare space for the following from an " old timer " in the industry, it should clear up any doubt regarding this type of conduit.

The name of the conduit is " Panzerrohr." The origin is almost certainly German, and the specification is given in the V.D.E. 1908. The specified sizes are 7, 9, 11, 13·5, 16 and up to 48 mm. The conduit consists of an asphalted paper tube covered with a zinc coated iron strip, laid on longitudinally, double lapped seam, to be watertight, the metal cover varying between 0·20 and 0·29 mm. This conduit was in common use in Germany and Belgium, and probably in many other Continental countries, for lighting circuits, the voltage being I believe 125 V a.c.

In the smaller installations this tube was only used for under-plaster work. Where the wiring ran in the open room it was usual to use steel dowels (with screw heads) driven into the wall, etc. Porcelain bobbins were screwed on to the dowels and ordinary twin twisted flex was used for the circuit; the flex opened out and slipped over the bobbins.

Another type of wiring used at this time was " Panzerader " in which insulated conductors were twisted together with jute into circular section and then covered with iron ribbon, either zinc or brass coated, and seamed up similarly to " Panzerrohr."

Sutton, Surrey. W. H. Shipman.

E.I.B.A. President's Appeal

AS the newly-elected President of the Electrical Industries Benevolent Association I shall be most grateful if I may say a few words about the Association and its work.

Before attending the recent E.I.B.A. annual general meeting, I read most carefully through the annual report and was deeply impressed by the wonderful progress which had been made in 1951. When I saw that its beneficiaries received last year from the E.I.B.A. £41,500 in money alone, an amount which showed an increase of 13 per cent over the previous year, I realized the magnitude of the task which faces us.

This task will not be made any easier at a time when high costs and shortage of money are dominating factors in the thoughts and lives of everybody, but I do want to call upon the electrical industry as a whole to do all they possibly can to see that the progress of the E.I.B.A., of which they must be so very proud (it is, I believe, unique in industry), is not only maintained but accelerated. I am certain that the best results can only be obtained by steady, hard work on the part of everybody concerned.

We need regular subscriptions and I should like, at the beginning of my presidential year, to make a special appeal to all those who are not already regular subscribers to the E.I.B.A. to join the Association straight away. Thus only, as the industry expands, can the work of the

Association keep pace with the ever-increasing demands for its help. I feel sure I shall not appeal in vain.

H. DRAKE,
President.

32, *Old Burlington Street, London, W.1.*

Hydro-Electric Economics

MUCH play has been made by hydro-electric enthusiasts of the rise in fuel cost over past years and the consequent advantage gained by the entire absence of a fuel bill.

However, in the light of the recently published operating results for the Highland schemes, which disclose comparatively low load factors, it is perhaps opportune to refer to the masterly treatise by Cdr. Fairthorne in your issue of 17th March, 1939, wherein it was emphasized that "a hydro-electric scheme is inherently more sensitive to changes in load factor that a fuel-consuming station is to proportionate variations in fuel cost."

Perspective appears to have been lost, and it would be interesting to know how the cost per unit generated (and transmitted) compares with that of thermal stations of the same magnitude.

CURIOUS.

Belfast Electricity Department

Annual Report Foreshadows Tariff Increases

ALTHOUGH the Belfast city electricity undertaking had a net surplus of £107,502 for the year ended 31st March last, Mr. W. J. McC. Girvan (city electrical engineer and general manager) says in his report that with increasing costs and a reduced rate of sales it will be necessary to increase tariffs. The marked improvement in the generating efficiency cannot offset the increases in capital charges in their entirety. The estimate of income and expenditure for the current financial year assumes that the amount of electricity sold will be equal to that of last year and that coal will remain at 76s a ton. Proposed new charges are shown in an appendix to the report. Mr. Girvan anticipates that these charges will result in a credit balance for the current year of £43,000. The new rates would operate after the meter readings for the third survey period of the current financial year.

In the past year revenue amounted to £2,086,648, an increase of £245,906 over that of the previous year, and working costs were £1,704,787. Total costs, including loan charges, increased by £250,328. The gross profit was £381,861 and the net surplus amounted to £107,502. Capital expenditure during the year totalled £1,617,045, raising the total net capital outlay at 31st March to £11,075,489. Sales of electricity totalled 374·9 million kWh, an increase of 20 million kWh, or 5·66 per cent. The number of additional consumers connected during the year was 4,943, making a total of 126,795. New substations put into service totalled 28, and extensions made to street lighting in the Corporation's area of supply increased the total number of lamps in service to 2,123.

The high-pressure plant in service at the Harbour power station since December, 1949, generated 51 per cent of the total output and used 23,000 tons less coal than did the low-pressure plant. The thermal efficiency of the station was 22·626 per cent. It is expected that the new 30 MW generator and one boiler will be in service by the end of October; the second boiler should be available by the end of November. The third boiler should be installed by February next.

Work on the Victoria power station has been held up by delays in steel supplies, the letting of contracts for civil engineering work and other causes, and the original commissioning date (30th September, 1953) has had to be deferred.

Courses for Plant Engineers

THE Education Committee of the Incorporated Plant Engineers announces that refresher courses for works and plant engineers will be held in the autumn at Glasgow and Liverpool. Each course will consist of twenty lectures, the Glasgow course being held at the Engineering Centre, 351, Sauchiehall Street, Glasgow, C.2, on Wednesday evenings commencing on 15th October, and the Liverpool course at the Liverpool University on Thursday evenings, commencing on 16th October. Particulars of the Glasgow lectures can be obtained from the secretary of the refresher course at the Engineering Centre, Glasgow, and the Liverpool lectures from the secretary of the refresher course, 9, The Temple, 24, Dale Street, Liverpool, 2.

Lighting a Nylon Factory

An Extensive Hot-Cathode Installation

NYLON yarn, with its unique properties, is used for some two hundred different purposes, ranging from women's stockings to flexible petrol tanks. All the nylon yarn made in Great Britain is produced at the Pontypool factory of British Nylon Spinners, Ltd. In this large modern works, with a floor space of one million square feet and a production capacity of 10 million lb weight of yarn a year, nylon polymer, which is received as a substance looking like white marble chips, is melted and spun into yarn which is then subjected to a series of processes, many of which are similar to those carried on in other textile mills. These processes, which include winding and throwing, demand good even illumination in every department if operators manipulating the extremely fine yarn are to work efficiently. Hot-cathode fluorescent lighting has therefore been adopted for all process, inspection and experimental departments.

The fluorescent lighting schemes for the 114ft spinning tower, the warping department, packing and inspection departments, and the experimental plant and the tungsten lighting scheme for the offices in the south block, were planned by the electrical section of the engineering department of B.N.S. in collaboration with the General Electric Co., Ltd. Altogether 600 G.E.C. fluorescent " Perspex " fittings and 1,800 vitreous enamelled trough fittings have been employed, all housing " Osram " 5ft 80 W " daylight " fluorescent lamps. Switching is arranged for large groups of fittings, since nylon spinning is a continuous process, twenty-four hours a day, seven days a week, and the lamps are therefore continuously alight. The warping department is an exception but even there lighting is in use for sixteen hours a day.

When the containers for nylon polymer reach the factory they are hoisted to the top floor of the spinning tower where their

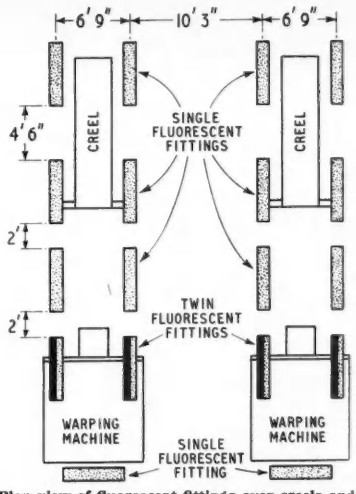
Part of the packing department showing special trunking; six lighting fittings are accommodated on each trunking run

contents are transferred to storage and mixing bins. Here general storage lighting is provided by single-lamp vitreous enamelled fluorescent fittings. From this floor the polymer is fed to travelling hoppers which charge the process hoppers. On this floor twin-lamp fluorescent fittings mounted between lines of hoppers give an illumination level of 10 lumens/sq ft at the points where the hoppers are handled, as well as good general illumination over the remainder of the floor area.

The polymer is melted and extruded through spinnerets, a process which is lit by fluorescent lamps in reflectors mounted at an angle of 45 deg to the banks of machines to give maximum illumination on the vertical plane. The constant temperature electric ovens in which extrusion mould assemblies are brought to their correct temperature were specially made by the G.E.C.

The molten polymer from the spinneret is cooled and hardened as it passes to the floor below, and by the time it reaches the ground floor of the tower is in the form of fine strands which are wound on to cylinders. Single-lamp vitreous enamelled fluorescent fittings have been adopted on this floor, and give an illumination level of about 20 lumens/sq ft on the cylinders.

In the warping department, where "Perspex" fluorescent fittings are employed, the pattern of the lighting scheme is dictated by the position of the machines. Individual nylon threads taken from banks of creels are drawn through a reed on to the warping drum. Particularly good illumination is required over the reed (which is movable from side to side of the machine and must therefore be well lit from each side) and over the beaming operation where the yarn is transferred from the drum to the beam. To facilitate maintenance, it was decided not to mount any lamps over the main drum of the machine. The arrangement finally adopted comprised three pairs of "Perspex" fittings, each housing a 5ft 80 W fluorescent lamp, over each creel and alley, at a mounting height of 9ft 2in; a pair of "Perspex" fittings, each with two 5ft 80 W fluorescent lamps, at a height of 7ft 9in over each reed, where the high illumination level of 40 lumens/sq ft is provided; and



Plan view of fluorescent fittings over creels and drums in the warping department

"Perspex" fluorescent fittings in the warping department give an illumination of 40 lumens/sq ft over the reeds, one of which is seen in the right foreground

a single-lamp fluorescent fitting 5ft 10in high over each beam. The necessity of good illumination over the warping machine can be gauged from the fact that 500 threads may be passing through the reed at one time and a break in any one of them must be instantly detected if it is not to hold up the whole warping process.

In the inspection and packing departments of the factory, where every bobbin and cone of yarn is individually inspected before packing, the lighting scheme has been planned for a minimum service intensity of 15 lumens/sq ft at conveyor level (2ft from the floor). This has been achieved by the use of fluorescent "Perspex" fittings mounted at 11ft, with 8ft spacing in each direction. For part of this department the G.E.C. has designed special trunking in place of conduit, six fittings being accommodated on each trunking run. Altogether 50 rows of twelve fittings have been treated in this manner.

For this installation the G.E.C. supplied 48in fans to circulate air in the gumming department where yarn is treated with gum to make knitting easier and the drying of the gum makes for a hotter atmosphere. Most of the factory's conduit requirements, conduit switch assemblies, and thousands of yards of Pirelli-General v.r. cable, were also provided by the company.

B.E.A. Scholarships

A SCHOLARSHIP scheme for employees in the electricity supply industry, prepared by the industry's National Joint Advisory Council, has been approved in principle by the British Electricity Authority and the Electricity Boards. The scheme provides for the annual award of scholarships to six manual workers and six to technical, clerical and administrative staff. The scholarships will normally be awarded for full-time courses of from six months to three years at universities and colleges and suitable courses will include those leading to degrees or diplomas in such subjects as engineering, law, pure and applied science (including the social sciences) and arts. Scholarships may be awarded to qualified employees for post-graduate courses.

Scholarship holders will draw their full normal pay during the courses, their fees and other charges will be paid and allowances will be made to cover other expenses.

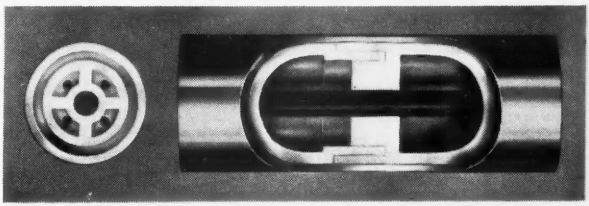
Selection of candidates will be made by a Scholarship Committee of the N.J.A.C. The first awards will be made in January–February next year.

Wenvoe Transmission Feeder

THE reserve feeders at the new B.B.C. television transmitter at Wenvoe, as in the case of the other B.B.C. transmitters, have been supplied by the Telegraph Construction & Maintenance Co., Ltd. This medium-sized semi-air-spaced cable (Telcon type A.S.84.Al) has probably the highest power rating of any cable of a quality suitable for use with television at very high frequencies. The two cables employed in the Wenvoe installation carry loads up to a maximum power of 20 kW (peak white) at approximately 50 Mc/s. The degree of electrical uniformity of propagation characteristics, so important for broad-band transmission such as television, is remarkably good. With a correctly terminated load, the voltage standing-wave ratio would not be worse than 0·98 over a 10 Mc/s band centred on 60 Mc/s.

The inner conductor is a solid copper wire of rather more than ¼in diameter. The insulation is formed by the assembly of a series of interlocking semi-cylindrical thimbles which are accurately moulded in "Telcothene" (polythene) of low dielectric loss, forming a smooth cylindrical surface on the outside of the core and providing a robust support at frequent intervals for the inner conductor.

The outer conductor is formed by a seamless extruded tube of high-conductivity aluminium applied to the core by the Johnson & Phillips process. This aluminium tube provides a highly efficient return conductor and an effective screen at all radio frequencies, and serves at the same time as a watertight sheath to protect the semi-air-spaced insulation. The normal corrosion-protective servings, comprising p.v.c. tape and hessians, are used. Its robustness and light weight permit it to be installed up masts without the usual steel wire armour.



Television transmission feeder cable

Conditions in Egypt

An Important United Kingdom Market

THERE is a considerable market for electrical machinery and apparatus in Egypt; in 1950 the total value amounted to £E6·8 million, as compared with £E6·3 million in 1949. (Egyptian £=20s 6¼d.)

In his report on the economic and commercial conditions in Egypt, dated October, 1951 (H.M. Stationery Office, 4s 6d), Mr. A. N. Cumberbatch, H.M. Minister (Commercial) at Cairo, says that the most valuable section of the electrical import trade is that for generators, motors and transformers. The tendency towards further industrialization, coupled with extensions to existing power stations in the country which are in progress or planned, should ensure that a large demand for such electrical machinery will continue for some time to come.

An appendix to the report giving the value of imports of electrical apparatus for the years 1947 to 1950 shows that the United Kingdom was by far the chief supplier of a wide range of electrical goods including generators, motors and transformers, radio sets and valves, electric cables, refrigerators, batteries and accumulators, telegraphic and telephonic apparatus and other electrical equipment.

Domestic Apparatus Demand

Although the relatively high cost of electricity has in the past handicapped sales of electric cooking and other domestic apparatus, Egypt is becoming more and more electrically-minded and the market is accordingly expanding rapidly. Such items as refrigerators, electric fans, toasters, heaters, irons, water heaters, etc., are in considerable demand, but up to the present only a limited market has existed for cookers, the general preference being for "Butagaz," oil burning stoves, and pressure stoves. Electrical equipment is also extensively used in hairdressing establishments. The principal single item of domestic electrical equipment sold in Egypt is the refrigerator, which is having a tremendous vogue.

Imports of radio receiving sets have been expanding rapidly, and a fairly extensive market is developing in the provinces for battery-operated sets. The chief demand, however, will continue to come from the principal towns for mains-operated sets capable of receiving the principal European stations on the short-wave band and local and nearby stations on the medium-wave band.

Local electrical production is mainly concerned with electric lighting apparatus. There are three main concerns engaged on the manufacture of electrical apparatus and fittings and there is a large local production of electric lamps and also of plastic fittings. A big increase has taken place in the use of neon and fluorescent lighting and there are several concerns engaged in the production and installation of these types. More recently, one or two local concerns have commenced assembling radio sets from imported parts.

Telephone Development

The demand for telephones is increasing, and in Cairo alone there is a waiting list estimated at 20,000 lines. The Telephone Administration programme aims at providing 10,000 additional subscribers' lines yearly, but even at this rate it will be several years before the present demands can be satisfied. Proposals are in hand to modernize the telegraph system and to introduce Arabic printing teleprinters and multi-channel telegraph circuits on all the principal trunk routes.

Little information is given in the report regarding electricity supply development, apart from a brief reference to the Aswan Dam hydro-electric project.

Electrical Engineers' Exhibition

THE Association of Supervising Electrical Engineers intends to run a second Electrical Engineers' Exhibition next year. The main theme on this occasion will be lighting and the arrangements will again be in the hands of Mr. P. A. Thorogood, 35, Gibbs Green, Edgware, Middlesex.

Future of the Electric Fire

Where the Critics are Wrong

By A. W. MOSS

CRITICS who have taken the lead in the electric fire controversy would have been less dogmatic if they had been more aware of the complications. And the controversy would never have arisen if the aims of those who plan had been rightly conceived and realized. Furthermore, dominating all other issues is atomic energy.

Can there be any doubt that we are at the beginning of a vast and fearful expansion in power? Electricity will be the medium for the distribution and application of this power. Its use for heating will be greatly increased to a point where even the combustion of fuel in the central heating systems of America will become redundant and where even the poorest home will have every room heated by electricity.

Shortsighted Policy

To say that at least twenty years must elapse before these changes begin, and that therefore our present shortage of fuel and generating plant are more important considerations are opinions of weight; but when some people say that electric fires should be banned or discouraged (the late Minister of Fuel said there was no future for them), not only are they lacking in vision but their judgment appears defective if they hope to cure our fuel troubles by such means.

Critics of the electric fire claim that it raises the peak load; that it decreases the load factor; and that it is wasteful owing to a low overall thermal efficiency. Further, they compare the electric fire unfavourably with the latest type of solid fuel grate.

It is true that domestic electric heating does raise the average load and also the peak load. The defenders of the electric fire must admit this obvious truth. It follows that if the use of electric fires were banned or restricted drastically then power cuts would be lessened or obviated. Yet no critic has had the courage or foolhardiness to offer a plan whereby this could be carried out for the obvious reason that it would be administratively and politically impossible to do it. One can well imagine the invidious position of the unfortunate official calling to collect electric fires from homes short of house coal on a cold winter day.

A smaller production of electric fires in the future is suggested: an idea which is superficially attractive because although it would only have a small effect for the first year or so there would be a cumulative effect which might be considerable after a number of years. But there are disadvantages. It would put a number of firms out of business and it would encourage the back street trader and the home handyman to make fires which would probably be shoddy and dangerous.

If by some unknown means they could prevent manufacture, so that at the end of, say, ten years the number of electric fires in use were considerably reduced, the critics would have achieved a reduction in the already low standards of domestic heating of this country to a point where, with just one solid fuel fire in the house, we would have achieved the most uncomfortable and spartan houses for winter use in the civilized world.

The result, too, would be a lack of privacy, often ignored in the arrangements of the smaller house, when the one and only warm room is often unsuitable for the student, the invalid, the lodger, and the boy and girl friends. And all this because the mining industry will not produce sufficient coal and because a reduction in the recommended number of power stations planned some years ago has caused a deficiency of generating plant.

American Comparison

On the subject of load factor the critics are not only unconvincing but unsound. The United States, they say, has a load factor of about 60 per cent while ours is about 40 per cent. The United States has

a low heating load, we have a high one; hence, so the argument runs, the electric fire is the wasteful culprit. The unsoundness of this is clear when we realize, first, that the climates of the two countries differ in such a way as to need different methods of heating, and secondly that the use of working shifts in the factories here to the same extent as in America would also improve our load factor immensely and end our peak load power cuts.

The critics blame the electric fire but they might with more justice blame our unwillingness to work shifts, or our dull and foggy winter days and the consequent liberal use of electric lighting for workers in industry. Moreover the defenders of the electric fire claim that it improves the load factor for the simple reason that it is used more during off-peak periods than otherwise and that our low load factor is due not to electric fires but to the habits of industry.

Electricity *v.* Solid Fuel

Surprisingly the opponents of the electric fire have concentrated on trying to prove that the electric fire is inefficient and wasteful. They could hardly have chosen, from their point of view, a worse argument, or have reduced it to such absurdity as when they claim that electric fires should not be used for more than 15 minutes at a time. Their argument is that as the solid fuel stove has an overall efficiency of at least 45 per cent and the electric fire only 20 per cent, therefore if we replace the electric fire with the stove we shall save large quantities of valuable fuel.

The answer by the defenders of the electric fire is broadly as follows: First, intermittent heating (4 hours or less) by electric fires is far more efficient than that of solid fuel fires of even the highest efficiency, and that as most domestic electric fires are used intermittently there would be a vast increase in coal consumption if solid fuel stoves were used instead. It is a matter of common knowledge that the solid fuel fire takes about 6 lb of fuel and two hours of time to get started and that it continues to give out heat when it is not wanted.

Secondly, the labour caused by the use of solid fuel fires or stoves is enormous. Not only does the laying, poking, feeding, and cleaning up of fires by the housewife or the maid amount to about 2,000 million man-hours a year, but add to this the tens of thousands of decorators, laundry workers, coalmen, and chimney sweeps, and it can be realized that tens of millions of capital is involved, and that hundreds of millions of pounds worth of labour is engaged per annum in dealing with solid fuel and its results. To all this must be added the effect of smoke pollution of the atmosphere on health and vegetation.

Thirdly, the solid fuel stove and slow burning grate rely more on convected heat than the electric fire. But convected heat from these stoves is not so economical as it appears in theory in obtaining comfort because British houses were never designed to be thus heated. The damp, temperate and uncertain British climate calls for radiant rather than convection heating.

Fourthly, the use of electric fires means that a house can be built more cheaply by cutting out chimneys and fire grates; and more space can be provided for the architect in his planning. The chimneys are open ventilators sucking up the warm air in a house and wasting it to the outside atmosphere.

Coal Consumption

Fifthly, for every ten tons of relatively high grade coal used in domestic grates about one ton of low grade coal, useful neither for domestic nor export consumption, is burnt at the power stations to provide electricity for domestic electric heating. It seems odd that the critics place the emphasis on saving on to the one ton of poor coal rather than on to the ten tons of good coal, especially when the low grade coal is in plentiful and increasing supply which can only be consumed either by extra use of electricity involving the installation of electrical appliances in the home or by industry buying and installing extra machinery and plant.

The critics of the electric fire do not appear to have effective answers to these points nor to be able to contest the claims that the electric fire is more efficient for intermittent heating than any other type of stove or fire except the gas fire, and the most flexible, convenient and clean of all types, and the easiest to install.

The influence of the academic mind, in science and economics, can be plainly felt in the arguments used against electric fires. British thermal units mean more to it than the comfort and convenience of the

home. A neat little plan means more to it than the broad trends and uncertainties of trade. Yet the post-war boom is slowly passing and may end in a slump, with some power stations idle for want of load. What then will be the soundness of any plan which removes a load beyond the possibility of immediate recovery?

Academic committees have a useful and necessary influence in offering detachment from trade interests; but they are dangerous unless balanced by a consideration for human relations and by the knowledge of the business man, administrator, practical engineer and consumer.

The average thermal efficiency of electricity sent out by the B.E.A. is about 20 per cent at the consumer's terminals. The average efficiency is rising year by year. By 1960 it should be at least 25 per cent. Plants in the United States achieve efficiencies of up to 37 per cent. This increasing efficiency coupled with the vast expansion of power opened up by the application of recent progress in nuclear physics means inevitably cheaper electricity, far less use of solid fuel and a cleaner, more comfortable and efficient home for us to look forward to in the years ahead, human planning and politics permitting.

Electrical Installation Practice

Three Recent Books

THERE are now available a number of works which deal with various aspects of electrical installation work with varying degrees of success; few, however, have the straightforward and concise approach which is the way of the authors of the books under review.* They show not only a thorough knowledge of the field covered, but deal with their subjects in a way which appeals to the practical electrical engineer who may find difficulty in digesting text-books and regulations covering similar ground in a less palatable form.

Each volume is particularly well illustrated with an average of just under 200 up-to-date illustrations or diagrams which will not only assist the reader to grasp the subject of the text but also undoubtedly hold his interest.

If there is a criticism of these volumes it is that the sections sometimes lack sequence. This is perhaps an inherent fault of a work by more than one author and must present a considerable problem to an editor. Mr. Molloy tends to confuse the reader when, for example, in the second volume listed, he introduces a chapter on fluorescent and discharge lamp installation and maintenance between one dealing with installations in small houses and flats and another which is concerned with hospital installations.

A similar example occurs in "Electrical Appliances: Installation and Maintenance" where a chapter on power factor correction is introduced between one on refrigeration and another on bell and alarm systems. It might in fact be considered that this chapter would be better placed in another of the volumes of the series not included in this review.

Perhaps the most obvious omission is the lack of a chapter dealing with tungsten lighting which might have preceeded the one devoted to fluorescent and discharge lamp installations in the second volume. A comparison of these two forms of light source might also have been helpful, particularly if it included information on the calculation of lighting intensities. These are, however, minor blemishes and are more than offset by several excellent qualities such as the specialized knowledge of agricultural matters which is revealed by the author of the chapter on agricultural installations and equipment in the second of the three volumes.

"Modern Wiring Practice" deals with the large majority of modern methods

*"**Modern Wiring Practice.**" By W. E. Steward, Associate I.E.E. (Pp. 228.) "**Electrical Equipment of Buildings.**" By 15 contributors. (Pp. 260.) "**Electrical Appliances: Installation and Maintenance.**" By six contributors. (Pp. 196.) Edited by E. Molloy. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 17s 6d each volume.

with simple clarity and skill. Perhaps the greatest appeal of this book is that it makes continual reference to the most important regulations governing electrical installation work, namely the I.E.E. Regulations for the Electrical Equipment of Buildings; the Electricity Supply Regulations; and the regulations made under the Factories Act. At the same time it explains in simple language the reasons for such regulations and how to apply them.

Having acquainted the reader with the many hazards, of which it is essential that he shall be aware, the author gets down to the detail of illustrating each system in a simple straightforward manner but always with an eye on these regulations. This is a method of instilling into the mind of the reader in a practical and palatable form the most important regulations and it is to be commended.

Equipment Design and Installation

"Electrical Equipment of Buildings" deals with the design, selection and installation of electrical equipment for most types of buildings, while at the same time setting out the electrical requirements for such buildings as hospitals, schools, theatres, cinemas, farms, and industrial and domestic premises. Its later chapters deal with the installation of private generating plants and storage batteries and then, having included an admirable chapter on lightning conductor protection, the book concludes, perhaps rather unexpectedly, with a glance at the intricacies of the electric time switch.

It would be quite impossible to cover completely the subject matter of this book in one volume and indeed the authors do not attempt to do so, but they do give the reader a good general insight into the electrical equipment of buildings in a way which creates a thirst for further and more detailed information.

The chapter devoted to theatre and cinema lighting installations is a typical example of this, where quite obviously it would be impossible to do justice to this involved subject in the space of 24 pages. The joint authors of this chapter have, however, produced one of the best short works which is available on this subject.

Domestic Appliances

The third volume under review deals fairly comprehensively with the installation and maintenance problems associated with domestic appliances. The scope is not quite so wide as that of the book just mentioned and as these volumes are about equal in size, greater justice is done to the subject in this case. The book should have a strong appeal to the electrical retailer (among others) who is called upon to provide efficient after-sales service to his customer.

Having covered the installation and maintenance of water heating appliances, cookers, refrigerators, as has been previously mentioned, this book goes off at a tangent in including an excellent chapter on power factor correction but it quickly regains its sequence by reverting to chapters on the installation of bell and alarm systems, telephones and public address equipment. Quite naturally this brings the editor to a chapter on broadcast and television receivers and finally to electric clocks and the international super-electric time system.

Congratulations are due to all those concerned in producing three works of undoubted value to the practical electrical engineer and to the industry as a whole.—S.L.M.B.

Mobile Staff Offices

THE first consignment of 3 ton trucks equipped as mobile staff offices has been delivered by Morris Commercial Cars, Ltd., to the War Office. These vehicles are designed primarily for administration purposes at H.Q. formations. Their mobility is increased by their independence of one particular source of electricity supply for the fan and interior lamps: a cable attached to the junction box enables the vehicles, during operations, to plug in to any mains supply. In addition, each truck carries spare batteries which may be used in an emergency. Lighting fittings, fans, cables and other electrical equipment were supplied by the General Electric Co., Ltd.

The body provides the maximum office working accommodation for four persons. It consists of a double shell, the outer shell being of steel and the inner one of hardboard. As the vehicle moves along, the circulation of air in the cavity between the two shells effectively insulates the interior from extremes of heat or cold outside. When the vehicle is parked and connected to a 230 V power supply a G.E.C. 7½in exhaust fan in the roof expels stale air from the office. Six specially designed tungsten fittings are recessed in the ceiling to a depth of 2in. These accommodate one 40 W lamp each, while a 12 W bulb has been incorporated in each of two ceiling fittings over the map boards, for use in an emergency or as pilot lights when the vehicle is in motion.

Commerce and Industry

Steel Output in 1951

Large Colliery Winders

THE total output of crude steel in 1951 was 15·6 million tons, about 4 per cent less than in 1950. This is shown in the first annual report of the Iron & Steel Corporation of Great Britain which was formed under the Iron & Steel Act and acquired on 15th February, 1951, the shares of the principal steel companies. The publicly-owned companies produced more than 98 per cent of the total tonnage of ingot steel. The output of steel for castings was 483,800 tons, of which 19 per cent was by publicly-owned companies.

The report states that although much of the industry's equipment is efficient some plants are out of date and expensive in manpower and fuel and large sums will need to be invested for many years in modernization and new plant. Capital investment has recently been at the rate of £50 million per annum and it is expected that investment will continue to run at about £60 million per annum. The Corporation is now drawing up with the industry a general development programme.

The financial figures cover the period from 15th February to 30th September last (7½ months) and show a consolidated profit, after depreciation, of £34,496,452. Interest on British Iron & Steel stock and other charges in connection with this stock, together with interest on loan and debentures, absorbed £6,903,573, and taxation required £19,631,506. After allowing £169,797 for the interests of outside shareholders, the profits retained in the group were £7,791,576.

Newfoundland's Possibilities

British industrialists were urged at a meeting held under the auspices of the Federation of British Industries last week to take a greater interest in Newfoundland. The speaker was Newfoundland's Prime Minister, the Hon. Joseph Smallwood, who said that in Labrador there were vast quantities of iron ore, together with manganese and, there was every reason to suppose, titanium, copper, lead and zinc. There were unlimited quantities of high-grade timber and a greater hydro-electric potential than was at present developed in all Canada.

American concerns were engaged in prospecting, mostly for minerals, and drilling for oil was in progress on the west coast. A new asbestos mine was in production and a copper mine would be starting up later this year. Mr. Smallwood said that there was not one British company engaged in these enterprises although there were some from the Continent of Europe.

Illumination Design Course

The E.L.M.A. Lighting Service Bureau, Leeds, is holding an Illumination Design Course on Wednesday evenings from 8th October to 12th November. Applications for reservations should be made to Mr. J. W. Howell at the Bureau, 24, Aire Street, Leeds, 1.

Lamp Publicity

This season the national lamp publicity policy of Crompton Parkinson, Ltd., is to maintain continuity with last season's campaign. "Switch to Crompton Lamps," the slogan that has now been employed for two years, again appears in thousands of 16-sheet "happy-switch" posters on shopping-centre sites. The publicity material available for stockists last season will be supplemented. In particular, an improved design of the popular string banner will be available. Carrying the slogan, with "Crompton" spelt out by lamp cut-outs, this banner is adjustable

Poster forming part of the lamp publicity of Crompton Parkinson, Ltd., for the coming season

to any length from 5ft to 12ft. A new six-colour counter display includes four partly cut-out lamps surmounted by a " cheerful switch " and the extended slogan " Switch to Crompton and you're on to a good lamp." The lamps are in a simple two-plane arrangement which is self-locking when opened out and forms a firm base. A new 24-page lamp price list will be available together with separate Crompton and Kye counter leaflets and price cards.

Car bulb publicity material remains the same and this season it will be supported by trade press advertising. A cycle bulb leaflet will also be distributed.

Blackpool Service Centre

The recently opened service centre of the North Western Electricity Board in Talbot Road, Blackpool, is proving very popular. Before its opening, Blackpool, with its large resident population and huge seasonal influx of holiday makers, was one of the biggest towns in the north-west still without a service centre. There had been a demand for a centre for many years and attempts had been made before and after nationalization to obtain a suitable site. Consumer service had been available from premises inconveniently situated. The new centre has been adapted from business premises and has been transformed and furnished on economical lines. It has a demonstration room seating sixty. Apart from the normal consumer service, the centre is available for payment of accounts.

Winding Equipment for N.C.B.

The General Electric Co., Ltd., has received from the National Coal Board a contract for two 3,700 h.p. electric skip winders, with control and protective gear,–for the Silverwood East and Cadeby Main Collieries, No. 3 Area, of the North Eastern Division. Each winder is designed to raise 528 tons of coal an hour from a depth of 2,299ft, and is fitted with twin parallel drums 18ft in diameter, which are driven through reduction gearing by an 0–320 r.p.m. d.c. motor. The 0–600 V d.c. supply for this motor is provided by a 2,650 kW Ward-Leonard set driven at 500 r.p.m. by an 11 kV synchronous motor. An interesting feature of the contract is the adoption of the G.E.C. cascade exciter control scheme to ensure speed of response with high stability. This scheme is a method of energizing the field of a generator in such a manner that the excitation can be varied and, if necessary, reversed in the minimum of time and by the expenditure of a very small amount of energy in the initiating circuit. In this instance the cascade exciters are used in conjunction with Ward-Leonard control and provide the excitation for the field of the generator which supplies the main winder motor.

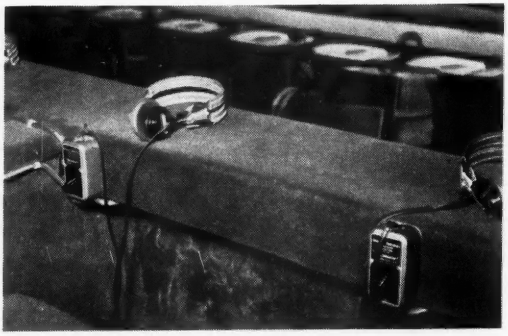
Hoover Welsh Factory

The factory of Hoover (Washing Machines), Ltd., at Merthyr Tydfil, Wales, which in mid-June went on to a shortened working week of four days, has returned to a five-day working week. Building development work at the Merthyr Tydfil factory, which is nearing completion, will bring the total floor space there to some 200,000 sq ft. Additional plant, costing £500,000, is in course of installation in the factory extension.

Multi-lingual System

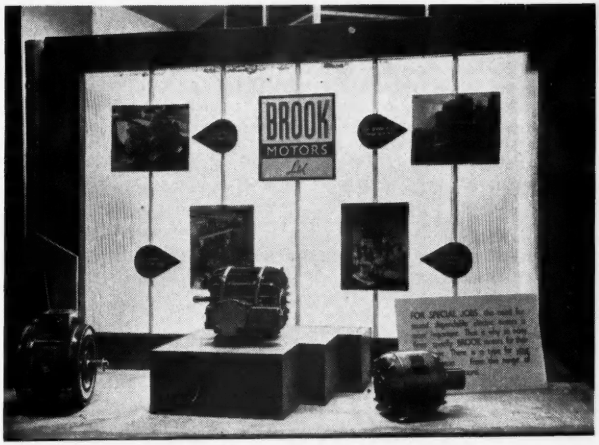
The meetings of the United Nations Assembly at the Palais de Chaillot, Paris, called for a multi-language simultaneous interpretation installation of a complex nature, and Tannoy Products, Ltd., which supplied material for a similar installation for the United Nations Organization in New York, was invited to equip, on a short-term rental basis, the main Assembly rendezvous in Paris. The theatre was equipped in such a manner that 2,400 seats were provided with simultaneous facilities for six channels.

Designs eliminating nails and screws had to be conceived, wiring had to be planned, and an installation capable of dismantling and re-assembling at some other rendezvous had to be envisaged. To meet the special requirements, Tannoy produced equipment which included prefabricated cabling (with the use of 12-pin plug and socket devices). This entailed providing selector units, each connected by a 12-core cable of special design without damaging the upholstery or seat fixtures. The selector units were



Part of the multi-language installation at the Palais de Chaillot, Paris

assembled in harness form to avoid soldering some 50,000 connections on site. The cables of the selector units were fixed by prefabricated special metal clips. The whole of the work was done at the company's London factories and the apparatus and material, installation engineers and technicians were flown over to France.



Brook Motors display at their London showrooms

Motor Window Display

The accompanying picture shows the current display in the London showrooms of Brook Motors, Ltd., at Westminster. It incorporates enlarged photographs depicting Brook motors on various installations. The photographs are mounted on a framed background which is enhanced by colour lighting behind the frame.

Brass Prices Reduced

The Minister of Supply has made an Order reducing the prices of brass, brass scrap and gilding metal scrap to take account of the recent alterations in the Ministry of Materials selling price for virgin zinc. The prices of 60/40 brass and brass scrap are reduced by £4 per ton, all other grades of brass and brass scrap by £3 per ton and gilding metal scrap by £1 per ton. The Order, the Copper, Zinc, etc., Prices (No. 5) Order (S.I. 1952 No. 1548, H.M. Stationery Office, 3d) came into force on 25th August, 1952.

Engineering Wages Claim

Last Friday representatives of the Confederation of Shipbuilding and Engineering Unions met the engineering employers, as instructed, to draw their attention to the "serious position" which had arisen as a consequence of their rejection of the unions' claim for a wage increase of £2 a week. Sir Alexander Ramsay, speaking for the employers, said that they still regarded the demand as unjustified and against the national interest and saw no reason to alter their decision. That reply seemed to leave matters as they were, but Sir Alexander went on to say that the unions' statement would be presented to the management board of the Employers' Federation on the following Thursday (i.e., yesterday) and the board's reply would be given to the Confederation on the following day. This reply is to be considered by the executive of the Confederation on Sunday at its meeting at Margate. Representatives of the thirty-eight unions concerned are to meet at York on 10th September.

At a meeting in Birmingham on 23rd August shop stewards of the Transport and General Workers' Union passed a resolution calling for a wage increase of a "reasonable character." The shop stewards represented about 30,000 workers in the engineering industry in the Birmingham area.

High-Voltage Laboratory

We regret having been misinformed about the manufacturers of the capacitors built into the impulse generator installed in the high voltage laboratory of the Brush Electrical Engineering Co., Ltd., at Loughborough, described in our issue of 8th August. We are asked to state that the 24 capacitors, each of 0·12 μF at 125 kV impulse rating, together with 24 spacer units, were made by the Telegraph Condenser Co., Ltd.

National Radio Show

The National Radio & Television Show, organized by the Radio Industry Council, opened at Earls Court, London, on Tuesday last. The Show remains open until 6th September. A review of the exhibits will appear in our next issue.

H. Fisher (Oldham), Ltd.

H. Fisher (Oldham), Ltd., inform us that some of their customers have been made to believe that the activities of this company are not being continued. The company has suffered very considerable losses on account of cancellation of orders from overseas markets,

e.g., Australia, and restriction of imports by Government decrees. For this reason it has been necessary to appoint two receivers for the debenture holders with the intention of reorganizing the company under the management of Mr. F. Lloyd-Kessel.

The receivers and Mr. Lloyd-Kessel point out that there is no intention of liquidating the company. All services are being continued as hitherto and it is hoped to overcome the present difficulties with a well-advanced development programme. Any further information concerning the status of the company can be obtained from Messrs. J. B. Brierley and A. Riley (joint receivers), c/o H. Fisher (Oldham), Ltd., Oldham, Lancs.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £157 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8½d
Sheet	ton £339 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £132 10s 0d
Foreign	ton £131 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £967 0s 0d
ZINC, G.O.B. Foreign	ton £122 0s 0d
Electrolytic	ton £126 0s 0d
BRASS Tubes	lb 2s 3½d
Sheet	lb 2s 6d
Wire	lb 2s 9d
PHOSPHOR BRONZE	
Wire	lb 4s 1½d
RUBBER, No. 1 R.S.S. spot ..	lb 21¼–24¼d

Workers' Rota Plan

The Metropolitan-Vickers Electrical Co., Ltd., Motherwell, has agreed to delay the suspension of about 300 redundant employees while they give consideration to a proposal by the workers that employment be continued for all on a rota system. Under the proposed rota every worker would be unemployed one week in five or six weeks. Departments affected produce cooking appliances for the Australian market.

Dispute Over Non-Union Employee

The erection of a large research building for C. A. Parsons & Co., Ltd., Newcastle-on-Tyne, has been delayed by a strike of building trade workers employed by Stephen Easten, Ltd., the contractors. The men objected to the employment of a terrazzo worker who they stated was not a member of a union. The man, however, claimed that he had applied for union membership but had heard nothing further. He offered to stay away from work until his union membership was settled, provided that his employers and Parsons were agreeable, but the latter were not in favour of this plan and the terrazzo worker remained at his work. The National Federation of Building Trade Operatives thereupon instructed its members on the site, numbering about 200, to stop work. The new research building is stated to be costing half a million pounds.

London Meter Readers' Strike

At the time of going to press there has been no further development in the strike of employees of the London Electricity Board at the Crooms Hill (Greenwich) depot. The Board announced earlier this week that a further 26 meter readers considered to be redundant had been given four weeks' notice of discharge.

Trade Announcements

Mr. C. H. Robertson, representative of **Ekco-Ensign Electric, Ltd.**, covering part of East London and adjoining part of Essex, has moved to 56, Meads Lane, Seven Kings, Essex (telephone : Seven Kings 1120).

Truvox, Ltd., announces that Mr. N. Wilson, c/o B. & H. (Nottm.), Ltd., Popham Street, Nottingham (telephone : Nottingham 43826), has been appointed agent for Truvox appliances and Truvox and Rola-Celestion loudspeakers for sale to the wholesale trade. Mr. Wilson will cover Leicestershire, Northamptonshire and Rutlandshire.

The Acme Electric Co., has opened a trade counter at its new warehouse at 123, Hanley Road, Stroud Green Road, London, N.4 (telephone : Enterprise 4591).

Catalogues and Lists

Sturtevant Engineering Co., Ltd., Southern House, Cannon Street, London, E.C.4.—Illustrated folder on axial flow fans (3201).

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester.—Up-to-date price list on "Nettle" shockproof electrical accessories (23).

Winston Electronics, Ltd., 1, Park Road, Hampton Hill, Hampton, Middlesex.—Technical brochure illustrating the diversity of the company's industrial electronic products.

Bailey Meters & Controls, Ltd., Progress Way, Purley Way, Croydon, Surrey.—Illustrated technical leaflet presenting the three-element steam temperature control system (C.8).

W. E. Burnand & Son, Duo Works, 65-106, Shoreham Street, Sheffield, 1.—Descriptive folder illustrating the uses of "Phoenix" electromagnets (LM/52).

Resistances, Ltd., 30, Oxford Road, Finsbury Park, London, N.4.—Illustrated priced catalogue of vitreous and non-vitreous resistances, toroidal units, etc.

OVERSEAS ELECTRICAL TRADE

Exports Recover in July

AFTER the somewhat severe drop in June, exports of electrical apparatus and machinery last month recovered by £2,551,206 to £15,392,409 but were still £1,022,425 below the May total. Compared with July last year the figure shows an improvement of £582,271 though it will be noticed that in more than half of the classifications given in Table I declines in trade are recorded.

A particularly big diminution is apparent in the demand for washing machines, vacuum cleaners and other electrically operated portable appliances, while other sections of the market showing substantially reduced business included such products as domestic radio apparatus, lamps, primary batteries, portable batteries, cooking appliances, time recorders and time switches, insulating cloth and tape and motors. The " bright spots " were cables, commercial radio apparatus, lighting appliances other than lamps, non-portable accumulators, commercial electrical instruments,

TABLE I.—ELECTRICAL EXPORTS

Class	July, 1951	July, 1952
	£	£
Telegraph and telephone cables and wires (submarine)	62,882	55,950
Ditto, not submarine	615,257	657,728
Wires and cables, paper insulated	536,219	1,086,969
Ditto, rubber insulated	524,237	685,523
Ditto, cotton, silk or artificial silk insulated	48,385	62,255
Ditto, enamel, glass or asbestos insulated	98,552	70,146
Ditto, other	236,094	283,224
Commercial radio apparatus	545,025	878,815
Domestic radio apparatus	446,742	404,434
Telegraph, telephone and signalling apparatus	1,560,280	1,621,073
Radio loudspeakers	56,952	55,640
Telecommunication components, n.e.s.	505,632	515,828
Other telecommunication apparatus	111,866	112,140
Valves and cathode-ray tubes	355,950	336,702
Carbons	27,259	19,995
Lamps, exceeding 24 V	97,353	65,689
Ditto, not exceeding 24 V	38,684	37,141
Other lighting appliances	365,176	562,032
Primary batteries	241,465	200,249
Parts other than carbons	37,230	19,447
Accumulators for motor vehicles	248,306	127,695
Ditto, traction	30,000	9,257
Ditto, radio	5,369	4,949
Other portable accumulators	74,480	57,554
All other accumulators	66,558	127,135
Parts and accessories	63,626	73,823
Cooking appliances	282,815	86,507
Heating appliances	87,375	75,989
Parts and accessories for cooking and heating appliances	62,823	85,341
Flat irons	70,868	58,660
Commercial electrical instruments	118,949	162,028
House service meters	101,246	129,582
Time recorders and time switches	35,966	9,154
Other electrical instruments	117,433	151,673
Electro-medical apparatus (not X-ray)	50,237	37,757
X-ray apparatus, tubes and parts	151,302	140,248
Permanent magnets	30,282	38,891
Insulating cloth and tape	111,362	65,294
Other insulating materials	100,168	75,499
Unclassified electrical goods and apparatus	573,333	569,475
TOTAL, electrical goods and apparatus	8,893,738	9,817,491
Diesel driven generators not exceeding 200 kW	479,853	408,955
Ditto, exceeding 200 kW	189,121	127,106
Other generating sets	128,580	316,450
Generators exported without prime movers, and parts of generators	474,302	518,013
Motors, railway, tramway and trolley bus	3,291	760
Ditto, other, not over ¼ h.p.	144,793	131,448
Ditto, over ¼ h.p. but under 1 h.p.	54,778	57,092
Ditto, from 1 h.p. to 250 h.p.	501,218	383,941
Ditto, exceeding 250 h.p.	51,095	150,588
Ditto, parts	80,665	86,800
Converting machinery	23,251	20,487
Transformers, including coils	884,967	774,941
Rectifiers for power house use	25,582	70,825
Motor starting and controlling gear	181,927	262,509
Switchgear and switchboards (not telegraph and telephone)	1,114,448	1,096,023
TOTAL, electrical machinery	4,337,871	4,405,938
Washing machines (not exceeding 250 lb weight)	606,484	317,633
Ditto, parts	21,351	40,377
Vacuum cleaners	266,130	140,473
Ditto, parts	44,634	17,166
Other electrically operated portable appliances and parts	252,929	155,958
Portable electric tools	116,085	128,330
Unspecified electrical machines, machinery and parts	270,916	369,043
GRAND TOTAL	14,810,138	15,392,409

house service meters, rectifiers, motor starting and controlling gear.

Exports of electrical goods and apparatus, as distinct from machinery, totalled £9,817,491, which was £923,753 more than in July, 1951. India was again the best market, increasing its purchases from £817,419 to £1,427,612. Australia has now dropped to fourth place in the list of buyers with £488,542, being below both South Africa (£817,963) and New Zealand (£724,890). An interesting development is the greatly increased trade with Indonesia (£132,848 compared with £21,277) and Russia (£53,329 compared with £5,185). A full analysis of the destination of exports is given in Table II.

Table II.—Distribution of Electrical Goods and Apparatus

Destination	July, 1951	July, 1952
	£	£
Channel Islands	43,918	32,835
Gibraltar	3,638	14,193
Malta and Gozo	9,485	11,420
Cyprus	38,931	17,189
British West Africa	147,362	133,117
Union of South Africa ..	818,256	817,963
Northern Rhodesia	27,033	55,914
Southern Rhodesia	97,334	182,998
British East Africa	262,732	170,793
Bahrein, Qatar and Trucial Oman	59,298	47,957
Kuwait		64,866
India	817,419	1,427,612
Pakistan	252,175	271,080
Malaya	330,234	423,544
Ceylon	116,781	86,636
Hong Kong	148,720	127,598
Australia	810,698	488,542
New Zealand	247,723	724,890
Canada	281,718	315,748
British West Indies	114,295	110,770
Anglo-Egyptian Sudan ..	15,190	55,188
Other Commonwealth Countries	88,610	109,348
Irish Republic	549,209	300,666
Soviet Union	5,185	53,329
Finland	42,552	102,496
Sweden	370,559	377,594
Norway	228,622	292,385
Iceland	34,925	11,912
Denmark	127,265	87,127
Poland	72,217	11,282
Germany	21,167	63,145
Netherlands	294,403	345,200
Belgium	117,867	174,118
France	82,122	99,349
Switzerland	59,299	52,774
Portugal	151,679	89,713
Spain	25,159	37,240
Italy	105,660	76,573
Austria	79,605	21,992
Czechoslovakia	41,395	9,549
Greece	98,536	31,877
Turkey	171,826	116,170
Portuguese East Africa ..	5,962	13,101
Syria	19,984	12,590
Lebanon	18,310	11,221
Israel	56,012	10,690
Egypt	172,712	112,182
Arabia	23,058	41,249
Iraq	19,087	80,527
Iran	14,111	13,072
Burma	38,896	63,583
Thailand	36,017	72,852
Indonesia	21,277	132,848
China	6,404	316
United States of America ..	129,207	107,942
Venezuela	110,474	53,940
Peru	91,912	31,274
Chile	39,433	37,286
Brazil	244,102	260,022
Uruguay	22,797	19,774
Argentine Republic	168,394	169,242
Other Foreign Countries ..	244,787	529,088
Total ..	8,893,738	9,817,491

Although overseas sales of generating plant on the whole showed an improvement, there was less demand for all types of diesel driven sets. Australia was still easily the best market for generators, accounting for £270,912 worth out of a total of £1,370,524, with India (£90,732) a long way behind. The decline in motor exports was confined mainly to sizes between 1 and 250 h.p., there actually being a marked advance in the sales of units above 250 h.p. from £51,095 to £150,588. Increased buying by South Africa (£146,680 compared with £92,870) went a long way to making up for a reduction from £154,689 to £61,757 in Australian trade. South Africa (£503,272), India (£324,821), Australia (£197,177) and Malaya (£150,587) absorbed a large part of other types of electrical machinery shipped abroad. Exports of generating plant to Canada declined, but there were increases in motors and other machinery.

Imports of electrical goods and apparatus in July amounted to £715,777, £92,866 more than in the corresponding month of last year. The largest items were radio, telecommunication and electronic apparatus (£195,606), valves (£171,160), furnace carbons (£89,772) and electrical instruments other than telegraph and telephone (£88,372). Holland (£208,027) and Canada (£115,985) were the biggest suppliers. Electrical machinery imports included generators (£29,021), motors (£35,119) and " all other sorts " (£23,247).

Welding Engineers' Course

IN addition to courses for welding operators and for designers and draughtsmen, the Quasi-Arc Co., Ltd., has courses lasting for three weeks for welding engineers, supervisors, inspectors and foremen. About half the time is allotted to technical and theoretical work and half to practical welding experience. The next three weeks' course will commence on 27th October. Application for enrolment should be sent to the company at Bilston, Staffs, or Bridgewater House, Cleveland Row, St. James's, London, S.W.1.

SALESMANSHIP NEEDED

Meeting Changed Circumstances

By A. C. JOHNSON

ONE of the underlying themes of this year's British Electrical Power Convention was the need for the electrical industry, and by that is meant the manufacturer, the supply industry and the electrical contractor, to get down to the business of selling.

Many members of the industry have felt that it is something like fifteen years since any selling in the true sense of the word was necessary. The demand for electricity has increased by leaps and bounds, manufacturers have been limited by raw materials and electrical contractors have enjoyed a post-war boom period with customers coming to their premises and asking for electrical appliances.

Conditions in the post-war years have been so far removed from those of the pre-war period that to-day there are many young men and women in the electrical industry who have never known what it is to sell and it is obviously going to take some little time to train these young people in what is to-day almost a forgotten art, namely that of salesmanship.

A Bold Approach

In pre-war days the only way to sell certain specialities such as refrigerators, vacuum cleaners and washing machines, was to take the article to the customer's home and demonstrate it on the premises. Most showroom assistants and electrical contractors would have swooned from shock if a customer had walked into their premises and stated that he wished to buy a washing machine. Practically all vacuum cleaners were sold on the knocker and were bought by the customer on hire-purchase.

As a new and comparatively small manufacturer of a new electrical product which may possibly come under the heading of a speciality, I have examined with a great deal of interest the showrooms of the Electricity Boards and electrical contractors and there can be no question but that there is a great need for improvement in the art of sales-compelling displays and particularly in the skilful art of selling to a customer who comes in to inquire. It is true that appliances are reasonably well displayed in most showrooms but nothing like sufficient use is made of sales aids such as showcards and special displays to stress the virtues of a particular appliance.

Some appliances which are operated by electricity may equally well be operated by another fuel and it is essential that the advantages of this particular appliance when operated by electricity are properly stressed by a showcard drawing attention to these particular sales points.

Excellent Showroom Staffs

The thing that has impressed me, as a newcomer to the trade, is the excellent type of individual now employed in the electrical industry and one must say a word in praise of the young ladies in particular. Most of the showroom staffs have a nice approach. There can be no question but that the average customer is well received, but the factor which is lacking is the technique of building up in the consumer's mind the desire to possess the particular article in which he or she has expressed interest and so leading the customer along so that in the end an order is obtained.

I would go so far as to say that many young men and women of to-day are a little hesitant of asking for the order. Some of them apparently feel it is something which is just not done or that it is bad manners to close the sale. All this is very easy to understand and one cannot blame these young men and women because, if the truth be known, they have not been trained to sell. They have been given a thorough technical knowledge of the product they are handling and they can unquestionably answer intelligently most of the questions which are put to them but I feel there is a need for a return to

some though perhaps not all of the sales methods which we all thought desirable before the war.

All manufacturers, I feel sure, might well co-operate by providing the services of their top-flight salesmen to demonstrate sales techniques and perhaps the electrical contractors' associations and supply authorities will organize salesmanship courses.

I have had the pleasure of addressing ironmongers' assistants' associations and have found these young men and women very keen to learn the art of selling. Perhaps we could have something similar in the electrical industry. In the gas industry they have their gas salesmen's circles which are most effective.

The object of this article is not to blame to-day's salesmen and saleswomen because I have emphasized that they are not to blame. It is merely to underline the fact that we are now entering a period when salesmanship is going to become more than ever necessary. Each manufacturer, each industry requires a share of the housewife's purse and the efficient manufacturer and the efficient industry merely ensure that they get their fair share. If they do not take this elementary precaution they will lose their share to more progressive manufacturers or more progressive industries.

Colliery Ventilation

IN a paper presented at the annual general meeting of the Institution of Heating and Ventilating Engineers, Mr. W. Idris Jones gave an account of contributions being made by the National Coal Board, of which he is director-general of science, towards improving the fuel situation. Of the total production of 211 million tons of deep-mined coal in 1951 (compared with 181 million in 1946), 10 million tons was consumed in cutting, mining and processing. This would be reduced in several ways, including the taking of more power from the efficient large stations of the British Electricity Authority.

Ventilation required an average of 5 (sometimes over 10) tons of air through the workings per ton of coal raised to remove noxious and explosive gases and coal dust. A very gassy pit might yield 4,000 cu ft of methane per ton; if the percentage exceeded 1¼, electric power could not be used or must be cut off. Bore holes were being drilled in a number of collieries to drain occluded methane, which often determined the rate of advance of the coal face; the gas would be piped to the surface for its potential power and chemical values. The possible use of ½ to 1 per cent of residual methane in the upcast air as fuel for gas turbines was being investigated in conjunction with the Ministry of Fuel and Power.

Gas turbines using little or no water would be particularly useful for generating electricity at collieries especially if they could use solid fuel. Much coal was found at over 4,000ft deep, where the strata temperature approached 120 deg F and ventilation air temperature rose 20 deg F through compression in the shafts. Air velocities of 4 to 6ft/sec were necessary for comfort, but above 8ft/sec dust harmful to health was whipped up. A large mine might require 5 kWh/ton (average) to force 5,000 cu ft/sec of air through 30 miles of cross-linked airways.

Air-flow distribution in relation to mine layout was being studied at Nottingham University by means of a servo-mechanism which automatically maintained a square law relationship between terminal voltage, simulating air pressure, and current, simulating air flow, thus representing the resistance of an airway. A number of units could be connected together to imitate resultant air flow of a ventilation system.

Outdoor Generating Plant

THE first completely outdoor steam plant on the Pacific coast of America is the Highgrove power station of the California Electric Power Co. According to *Electrical West*, the overall cost is estimated at $140/kW for the first two standard 30 MW sets operating with steam conditions of 850 lb/sq in and 900 deg F and at $135 in 1954 when two 40 MW sets with steam conditions of 1,250 lb/sq in and 950 deg F have been added. The anticipated heat rate for the first two sets is 12,500 B.Th.U./kW net.

Side-entry condensers reduce head room between turbine level and condenser level to 14ft from the usual 19 to 22ft, effecting a reduction in foundation costs of about one-third. The turbines are protected by a locally fabricated removable steel plate housing. The alternators are hydrogen cooled. In the boiler house only the firing aisle is roofed over.

Mercury-Arc Rectifiers

How Reactance Affects Regulation

By F. T. BENNELL, A.M.I.E.E.

THIS article seeks to clarify the terms "commutating reactance" and "normal transformer reactance" as applied to rectifier design; to indicate conversion from one to the other; and to explain the relationships between the normal transformer reactance and the degree of regulation it exerts on the voltage at which d.c. is delivered by the equipment.

The main component of the natural regulation of the output voltage from the d.c. side of a mercury-arc rectifier is the voltage drop due to "anode" reactance in the transformer, meaning that reactance which may be considered to be in the anode leads. The equation relating the reactance to the drop in voltage it causes on the d.c. side is $d = \frac{I_d X_p}{2\pi n^2}$ where I_d is the d.c. and p the number of rectifier phases, n being the number of phase groups; but X is not so readily defined. Nominally it is the equivalent anode reactance per phase in ohms, but this is not a complete definition.

The voltage drop expressed by the equation arises not exactly from the reactance presented to a change of current in an individual anode circuit, but that presented to a transfer of current from one anode to another during commutation and halved to obtain this reactance per phase. It is therefore half the "commutating reactance," meaning that reactance which is presented to the circulation of a commutating component of current during commutation.

The commutating reactance X_c is measured in the following manner, which also provides a precise definition of the term: X_c = the commutating reactance in ohms between any anode and the anode to which it commutates. It is measured by completely short-circuiting the primary winding (Fig. 1) and then applying across the two anodes the sinusoidal voltage required to furnish the rated r.m.s. anode current, thence subtracting in quadrature the relevant resistance.

It will be appreciated that this is not the normal way of expressing the reactance of a transformer, which is as follows: $X\% =$ the reactive voltage drop, referred to the primary, at rated primary current, as a percentage of the primary voltage. It is measured by completely short-circuiting the secondary winding and then applying to the primary the voltage required to furnish the rated primary current, thence subtracting in quadrature the IR drop.

To convert X_c to $X\%$ the following basic operations are required: (*a*) divide X_c by 2 to obtain the commutating reactance per phase; (*b*) multiply by the voltage ratio squared to obtain the equivalent primary reactance; (*c*) multiply by the primary current and express this reactive voltage drop as a percentage of the primary voltage:

$$X\% = 100. \left(\frac{E_p}{E_s}\right)^2 \cdot \frac{I_p}{E_p} \cdot \frac{X_c}{2}$$

$$= 100. \frac{I_p}{\frac{E_p}{E_s}} \cdot \frac{X_c}{2} \quad \ldots\ldots\ldots(1)$$

where I_p is the primary current and E_p and E_s the primary and secondary voltages respectively.

The percentage d.c. regulation:

$$\frac{d}{V_{do}} 100\% = 100. \frac{I_d p}{2\pi n^2} \cdot \frac{X_c}{2} \cdot \frac{1}{V_{do}}$$

$$= \frac{p}{2\pi n^2} \cdot \frac{I_d}{\frac{I_p}{\frac{E_p}{E_s}}} \cdot \frac{E_s}{V_{do}} = X\% \ldots(2)$$

The application of this general equation to transformer designs in common use for rectifier circuits is not always straightforward, so several of the points arising are dealt with in the following examples.

Single-phase full-wave—the two transformer anode windings have a common flux circuit and X_c is therefore not twice the secondary reactance per phase as for two independent windings in series, but four times as for one winding with double the turns. An alternative and simpler way

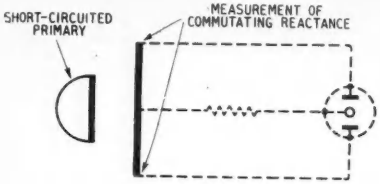


Fig. 1.—Single-phase rectifier transformer

of arriving at the same result is by ignoring the division of the secondary windings and referring the complete commutating reactance to the primary.

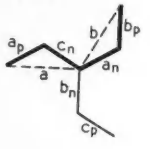
Three-phase zig-zag—the result of dividing each anode winding between two phases may appear at first sight to alter the reactance. It does in fact decrease the reactance of each anode winding, measured separately, but it can be shown that provided the voltage vectors are displaced 120 degrees from one another (as they are in a 3-phase transformer) the resultant commutating reactance is unaffected by interphase connections. This is to say that, referring to Fig. 2:

$$(a_n + a_p)^2 + c_n^2 + b_p^2 = a^2 + b^2.$$

X_c is measured by applying a single-phase voltage to the commutating anodes, so the terms are added algebraically and not vectorially; the winding sections are squared since the reactance varies as the square of the voltage, or turns, while a_p and a_n are added before squaring because they are on the same transformer leg. This result holds good whether the winding sections are equal as for a 3-phase transformer, or unequal as for a 12-phase quadruple-star transformer.

Six-phase fork—referring to Fig. 3, commutation between anodes a_1 and c_2 involves only a section of the windings in those phases. Each section has a voltage equal to the total anode-to-neutral voltage divided by $\sqrt{3}$. The reactance of the winding section is therefore a third of the anode-to-neutral reactance.

Fig. 2.—Three-phase zig-zag connection



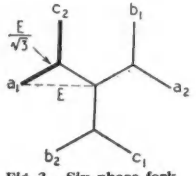


Fig. 3.—Six-phase fork connection

The outer winding sections of anodes c_2 and b_1 produce the same flux in the same transformer leg and therefore a transfer of current from one of these sections to the other does not produce any flux change and is not opposed by reactance. The commutating reactance of the inner winding sections is equivalent to that from a_1 to c_2.

Equations (1) and (2) are basic relationships that substantially hold good for all normal transformer designs in common use.

It has been assumed that all secondary leakage flux on any leg links with all the secondary winding on that leg. If the physical disposition of the windings is such that it renders this premise substantially incorrect, then the regulation cannot accurately be determined from the normal transformer percentage reactance. It must be obtained from the calculated, or measured, commutating reactance, which will take into effect reactance between secondary windings on the same leg.

TABLE I.—REACTANCE RELATIONSHIPS

Connection	$X\%$	$\frac{d}{V_{do}}\%$
Single-phase, full-wave	$100.\frac{1}{\pi\sqrt{2}}.\frac{I_d X_c}{V_{do}}$	$0{\cdot}707X\%$
3-ph. delta/star 3-ph. delta/zig-zag	$100.\frac{\sqrt{3}}{2\pi}.\frac{I_d X_c}{V_{do}}$	$0{\cdot}866X\%$
6-ph. delta/double star	$100.\frac{3}{4\pi}.\frac{I_d X_c}{V_{do}}$	$0{\cdot}5X\%$
6-ph. delta/fork	$100.\frac{3}{\pi}.\frac{I_d X_c}{V_{do}}$	$0{\cdot}5X\%$
12-ph. delta/quad. zig-zag	$100.{\cdot}23.\frac{I_d X_c}{V_{do}}$	$0{\cdot}259X\%$

The relationships between the normal transformer percentage reactance, the commutating reactance in ohms and the percentage d.c. regulation are indicated in Table I for the rectifier circuits in common use.

L.C.C. Educational Guide

THE new edition of "Floodlight," the L.C.C.'s guide to further education, is now available and can be obtained from bookshops and newsagents at 9d (1s by post), or from the L.C.C. Information Bureau, County Hall (Room 8, South Block), London, S.E.1. This sets out facilities for evening classes and technical courses for the 1952–53 session and contains the addresses of 200 colleges and institutes. Enrolment week begins on 15th September.

ELECTRICITY SUPPLY

Rural Electrification Methods

New Power System for Lynmouth

AT a meeting of the S.W. Scotland Electricity Consultative Council at Greenock on 21st August, Mr. William Young moved that the Board should be invited to consider means whereby greater progress could be made in the supply of electricity to rural areas. He said that while scientific development had resulted in the complete reorganization of industry, the same old methods of erecting poles and overhead lines were being employed. It was agreed that rather than pass a formal resolution a letter should be sent to the Board outlining the trend of the discussion and that the chairman should amplify the letter by personal statement.

At a luncheon in connection with the meeting Mr. W. H. George, Clyde Sub-Area engineer, said that the total number of farms now supplied with electricity in the Sub-Area was 700. There were still more than 200 farms not connected but it was hoped to complete the scheme by March, 1954—two years ahead of schedule.

Plant Position in Scotland

In Glasgow last Friday Mr. Charles Murdoch, chairman of the Scottish Board for Industry, gave provisional details of the electricity supply position next winter, which, he said, quite frankly did not call for optimism. There were now two 30 MW sets working at Clydesmill and three 50 MW sets at Braehead. Compared with last winter that represented an increase of 54 MW in capacity, but against that 72 MW had to be scrapped to make room for future extensions and 29 MW had to be taken out of service on account of circuit limitations, giving a net reduction of 47 MW. Estimates prepared by the Board, based on average winter weather conditions, showed a maximum demand in November of 1,060 MW, in December and January of 1,120 MW, and in February of 1,080 MW. The estimated maximum plant capacity for the same period, after allowing for 12 per cent out of commission and for the supply from the North of Scotland Board, was: November, 1,023 MW; December and January, 1,037 MW; and February, 1,033 MW. Assuming an export to the South of 80 MW the gap between maximum supply and estimated maximum demand would be 117 MW in November, 163 MW in December and January, and 127 MW in February.

Lynmouth Generating Station

In our last issue we reported the damage caused to the Lynmouth power station by the recent disastrous floods. When the floods struck Lynmouth, Mr. C. H. Postles, engineer-in-charge, disregarding the peril to himself, continued the running of the station on diesel engines after the hydro plant had failed. Not until the flywheels of the diesel engines were picking up water from the submerged floor did he shut down the station.

Electricity staff from Somerset and Devon, who had been working night and day to bring emergency supplies to Lynton, completed their task by the morning of 21st August

The storage reservoir at Lynmouth which provided a reserve of power during the peak demand. Mr. C. H. Postles, engineer-in-charge, is on the right (picture taken before the floods)

when a new supply of electricity had been brought to all consumers. The South Western Electricity Board and the South Western Division of the British Electricity Authority in a joint statement announced plans for a new power system to proceed in parallel with the reconstruction of the district.

As a result of the damage to buildings and plant at the station it is unlikely that it will again operate at 100 c/s.

Kintyre Extension

The crowning seat of the Dalriadic kings of Scotland became the latest place to be modernized by the North of Scotland Hydro-Electric Board when an electricity supply was recently provided at the Lochfyneside village of Minard. Fourteen miles from Minard is where the Stone of Destiny is reputed to have had its first resting place in Scotland after being brought from Ireland. This is at Dunadd, near where the switching-on took place. On a field overlooking the straggling village on the shores of Lochfyne Sir George Campbell, Bt., a member of Argyll County Council, brought power to the village and to his estate by inserting a fuse. Sir George was introduced by Mr. Charles Sellars, district engineer, who deputized for Mr. B. P. Johnson, area manager of the Board at Campbeltown. Mr. Sellars was accompanied by Mr. A. Watson, overhead line engineer of Strain & Robertson, consulting engineers, Glasgow. The power for Minard is taken from the Glen Lussa scheme in Kintyre (not yet officially opened) and from the diesel generating station at Ardrishaig. At Minard, two pole-mounted transformers are used to step down the 33 kV supply. Six large farms have been linked up and power has been introduced to the Crarae granite quarry which is being reopened.

Stratford Inquiry

When the cost of contributions out of public funds for providing electricity to an isolated cottage in a Stratford-on-Avon beauty spot—Cliff Cottage, Alveston—was being discussed at a public inquiry in Stratford Town Hall last week Mr. T. E. Lowth, Town Clerk of Stratford, asked for certain figures.

Mr. G. P. Wilson, for the Midlands Electricity Board, said it was rather a private matter. For municipal corporations to cross-examine Electricity Boards on questions of policy might be good fun, but hardly what Parliament had intended. Mr. H. W. Grimmitt, of the Ministry of Fuel and Power, who conducted the inquiry, remarked that the information had always been freely given in the past, adding " My experience is that Electricity Boards generally get their pound of flesh and are by no means very generous."

It was stated that in this case the M.E.B. would contribute £309 towards the total cost of £689 for supplying electricity to one small cottage. Mr. Wilson declined to enter into the controversy on overhead versus underground cables, but said that the Board would do all it could with regard to careful siting and using natural objects, such as trees, for screening. It would cost £725 more to put the cables underground.

Addressing the inspector, the Town Clerk said his Council had a genuine and emphatic desire to prevent encroachment of overhead lines, pylons or poles in its territory. The inspector concluded by saying that it was creditable that even an odd cottage could have the amenity of electricity.

Quebec Development

The Premier of Quebec (Mr. Duplessis) announced recently that the Quebec Hydro-Electric Power Commission is to undertake a $100 million project to provide power throughout the Gaspé Peninsula, where considerable mining development is in prospect. The site of the power scheme is at the mouth of the St. Lawrence River where the Bersimis River flows into it, 30 miles from the pulp and paper centre of Baie Comeau. The Gaspé Peninsula is on the opposite side of the St. Lawrence, 40 miles wide at that point, and the scheme would necessitate the laying of underwater cables across the river.

Supply Stoppage in Thanet

Part of the Thanet electricity supply was cut off on 18th August following explosions and a fire caused by a fault in a high-voltage cable. Local generators at Margate and Broadstairs were started up and supply was restored to hospitals, factories and telephone exchanges within two hours.

Change-over

The city engineer of Glasgow has reported that the first stage of the work of changing over the electrical installation in the Municipal Buildings to a.c. has been carried out and it is now proposed to proceed with the second stage, comprising the replacing of all d.c. plant in the east portion of the buildings and the installation of new distribution boards and cables from the new rising mains at an estimated cost of £9,950.

Morecambe Illuminations

The Morecambe and Heysham illuminations on which the Corporation has spent £3,500, were officially switched on last Friday.

Dronfield Service Centre

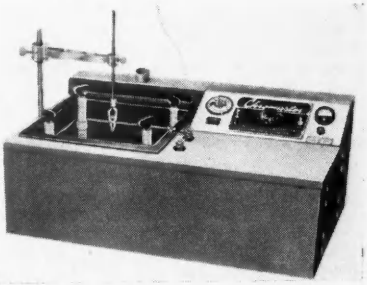
Yorkshire Electricity Board No. 3 (Sheffield) Sub-Area has opened an Electricity Service Centre at 44, Sheffield Road, Dronfield.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Large Television Tube

A NEW cathode-ray tube manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, is a 16in diameter circular all-glass tube with a virtually flat face and an aluminized screen. It incorporates a triode gun. The recommended e.h.t. voltage is 12 kV, the heater being rated at 6·3 V and 0·3 A. This tube, which is designed for wide-angle scanning, has a neck diameter of 38mm and an overall length of 460mm; a B12A duodecal base is used, the anode connection being made by flush side-contact. The catalogue number is 6901A and the tube is priced at £16 15s, plus £8 14s 3d purchase tax in the United Kingdom.



"Chromaster" bench type industrial hard chrome plating vat

Hard-Chrome Plating

A self-contained hard-chrome plating outfit is being introduced by REFRIGERATOR COMPONENTS, LTD., 12, Greycoat Place, Westminster, S.W.1. The bench model is compact and simple to operate; directions are given in an instruction booklet. When the control panel for the required current density and deposition time has been pre-set the instrument rings a bell when the object to be plated has been properly coated.

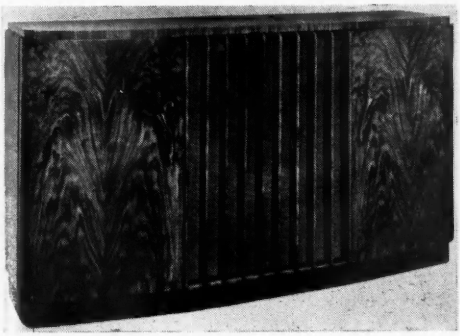
The "Chromaster," which is plug-connected to any ordinary a.c. mains socket outlet, embodies a dry disc selenium full-wave rectifier which delivers d.c. across the bath. Success depends upon the use of "Chromasol" electrolyte, the composition of which solution has not been revealed. Providing the surface of the base metal is uniform, finished to a degree that removes the rough grinding marks, and that it is free from grease, there should be no difficulty in following contour exactly or in plating to the desired tolerance, which is accomplished simply by gauging the time of immersion in the vat. Every three minutes a uniform deposit 0·0001in thick is applied to the surface of the object being coated. The outfit seems very suitable for reducing corrosion and wear, building up worn parts and prolonging the service life of cutting tools used by machinists.

Luxury Radiogram

A recital of musical and vocal recordings in the Royal Festival Hall last week served to demonstrate the performance—and it is very good—of the Ferguson model 500 radio-gramophone set announced by THORN ELECTRICAL INDUSTRIES, LTD., 233, Shaftesbury Avenue, London, W.C.2.

This luxury set, price £260 tax paid, consists of an audio-amplifier and a radio receiver on separate chassis, a two-unit loudspeaker system of wide range in an acoustic enclosure, a three-speed automatic record changer and separate lightweight pick-up heads for standard and long-playing records, all contained in a horizontal walnut console finished with bird's-eye maple.

Doors on each side give access to the control panel on the left and the record changer compartment on the right, which is illuminated internally when the door is opened and has room below for 140

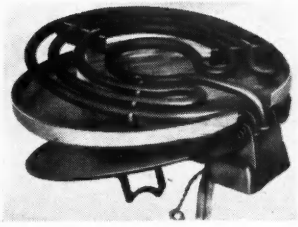


Ferguson 500 radiogram

records. Short, medium and long wavebands are covered, the wave-range switch having two positions: "MW local" for the reception of nearby powerful stations and "MW dist" to enable the weaker and more distant stations to be heard with least interference. The tuning drive is flywheel loaded, enabling the whole of the illuminated scale to be traversed rapidly. Three additional controls affect tonal balance: two of them increase and decrease the level of the treble and bass response relative to the centre of the audible range, while the third is a five-position filter control for reducing high-note response of the receiver by fixed amounts; there are also a volume control and an on-off switch. The 9-valve superhet circuit with push-pull a.f. amplification provides 14 W output with not more than 1 per cent total harmonic distortion, which is reduced to 0·35 per cent at 10 W output and 0·1 per cent at 6 W. Two Celestion permanent magnet speakers of special high flux density are incorporated: a 12in bass unit deals with frequencies of from 40 to 1,000 c/s and a 5in treble unit covers the 1,000 to 10,000 c/s range. The cabinet is 4ft 10in wide by 2ft 10in high and 1ft 5½in deep.

Radiant Boiling Plates

For use with its "Simmerstat," SUNVIC CONTROLS, LTD., 10, Essex Street, London, W.C.2, has introduced a range of one-circuit radiant boiling plates. The low thermal capacity of these plates ensures rapid response to "Simmerstat" control, resulting in energy economy. Two sizes, 6½in and 8in, are being produced, each in three forms—coil and terminal box only (prices £1 14s 3d and £2 7s); complete



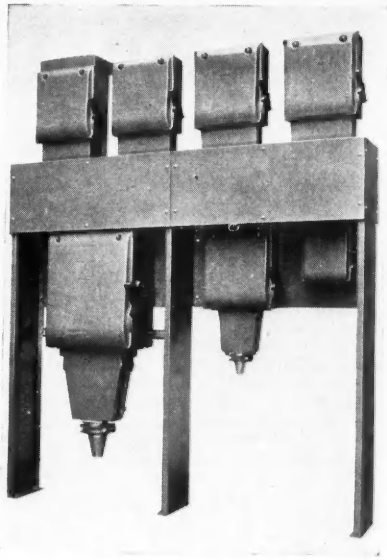
Sunvic boiling plate; coil with the reflector and plate support

with reflector and support (£1 18s 9d and £2 12s 6d); and complete on "E.D.A." cradle (£2 11s 6d and £3 5s).

The heating element comprises a nickel-chrome wire helix held centrally in an "Inconel" sheath by means of magnesium oxide. The terminal box is of a corrosion resisting nature and the reflector of polished aluminium. The heater and terminal box assembly is mounted on the steel support plate by hinge pins.

Ironclad Switchgear

A feature of a new range of ironclad switch fuses and fused switches introduced by the



Switchboard assembly built up from the newly-designed G.E.C. components

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is the pleasing external appearance, there being no unsightly projections. The pressed-steel cases, with internal fixing holes, are provided with cast-iron covers fitted with gaskets. Ample wiring space has been allowed inside the cases, with alternative entries at top and bottom for incoming and outgoing cables, while to facilitate still further the wiring and making of connections, the spindle carrying the switch blades can be removed merely by axial pressure against a retaining spring.

A solid brass bar replaces the usual flexible connection between the switch and the fuse. The range covers switch fuses from 15 to 100 A, with semi-enclosed or h.r.c. fuses, and fused switches from 100 to 500 A, with h.r.c. fuses only.

To enable engineers to build switchboards either on site or in their own workshops, a complete range of G.E.C. switchboard components and accessories is now planned for use with this new switchgear. The components include busbar chambers, pedestals and support bars, cable sockets and boxes, glands, metering chambers, reverse-entry and adaptor boxes. All necessary nuts and bolts are supplied. Assembly and erection require only the drilling and slotting of the busbar chambers to accommodate the desired switch units, and the drilling of the support for switch fuses mounted below the chambers.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Thorn Electrical Industries, Ltd.—The financial results for the year ended 31st March last were given in our last week's issue. In the report and accounts now published the directors state that owing to the continued expansion of the business of the group, it is anticipated that further finance will be required up to a substantial figure within the next two years. It may be more advantageous and practicable to raise further finance by the issue of loan capital rather than share capital, and, therefore, it is desirable that the existing limits on borrowing powers should be increased to £2,000,000. A resolution to this effect will be submitted at an extraordinary meeting which will follow the annual general meeting on 17th September.

The accounts have been published in brochure form, reviewing the progress of the group and illustrating the new sales headquarters, the works, and some fluorescent lighting installations incorporating the company's lamps.

The Pirelli-General Cable Works, Ltd., reports a profit for the year ended 31st March last, after providing for depreciation, of £1,516,558, as compared with £961,653, and after deducting £731,228 for taxation, there is a net profit of £772,080 (£332,502), to which is added £226,362, adjustments in respect of past years. Reserves receive £700,000. It is proposed to pay a dividend of 8 per cent, and a bonus of 12 per cent (both unchanged). The balance carried forward is £825,830 (against £632,388 brought in).

The Sterling Cable Co., Ltd., reports a group trading profit for the year ended 31st March last of £127,303, as compared with £102,331 for 1950-51. Taxation absorbs £76,051. It is proposed to pay an ordinary dividend for the year of 10 per cent (against 7½ per cent), and a bonus of 2½ per cent (nil). The balance carried forward is £15,559 (against £14,374).

Pye, Ltd., reports a group profit for the year ended 31st March last of £611,039, as compared with £541,930 for the preceding year, and after deducting £448,820 for taxation, the group net profit is £162,219 (against £183,614), of which £160,579 is attributable to the parent company. Deferred dividend reserve receives £21,000, and £21,000 is allocated to employees' profit sharing. It is proposed to maintain the dividend on the deferred at 18 per cent for the year, and, as in the previous year, 5½ per cent is from dividend reserve. The 8 per cent participating preferred again receives an extra 2 per cent, making a total of 10 per cent for the year.

A. C. Cossor, Ltd., reports a group trading profit, with investment income, of £487,977 for the year to 31st March last, as compared with £481,169 for the preceding year, and a net profit, after providing £134,058 for taxation, of £125,393, to which is added £19,829 brought in, making £145,222. Three years' dividend is paid on the 6 per cent cumulative preference shares, and an ordinary dividend is resumed with a payment of 10 per cent. No payments on the ordinary shares have been made for the four previous years. The balance carried forward is £54,472.

In his statement which accompanies the report and accounts, Lord Burghley (chairman) says that on the radio and television side, the year was marked by a further advance in television sales, but a considerable falling-off in radio; they have, however, well maintained their place in the industry. The Instrument Department has made good progress and the marine radar sales have been steady. On the electronic engineering side they have increased their output, but much of the year was spent in preparatory work for certain large Government contracts on which production was only just starting at the end of the year. About 30 per cent of their total turnover has been for export. The Research and Development Division has completed a number of important assignments, and their subsidiary companies have had a successful year.

The question how best to provide further capital resources is being carefully considered. For the present they are continuing to rely on temporary finance, and at the annual general meeting on 16th September a resolution will be submitted increasing the company's borrowing powers from £1,125,000 to twice the amount of the paid-up capital for the time being, or £2,200,000.

The Automatic Telephone & Electric Co., Ltd., has declared an interim dividend of 3 per cent (same) on the ordinary stock. This is paid on increased capital.

The Rheostatic Co., Ltd., has declared an unchanged interim dividend of 4 per cent.

New Companies

W-B Electro-Mechanics, Ltd.—Registered 7th August. Capital £100. Manufacturers of electrical and mechanical apparatus, etc. E. P. Wade-Brown is the first director. Regd. office : 49, Kensal Road, W.10.

Walker Electronics, Ltd.—Registered 30th July. Capital £1,000. To acquire the business of an importer and exporter of and dealer in electronics, electro-mechanical and other electrical apparatus and accessories now carried on by J. A. Walker, at 31, Kingsmead Avenue, Worcester Park, Surrey. J. A. Walker signs as director. Regd. office : 34/5, Norfolk Street, Strand, W.C.2.

W. H. Gatley & Co., Ltd.—Registered 9th August. Capital £1,000. Electrical engineers, wholesalers and retailers of electrical appliances and equipment, including radio, television, etc. Directors : J. B. Gatley and Mrs. Doris Gatley. Regd. office : Water Street, Todmorden.

Peterlite Products, Ltd. — Registered 31st July. Capital £100. To acquire letters patents and brevets d'invention, and to carry on the business of electrical or mechanical engineers, electricians, founders, smiths and machinists, etc. Directors : P. M. J. Koch De Gooreynd and W. S. Gregg. Solicitors : Hextall Erskine & Mudford, 7, Haymarket, S.W.1.

Jaymac (Engineering), Ltd.—Registered 13th August. Capital £500. General and electrical engineers, specialists in the manufacture of insulating materials, etc. Directors : J. W. A. McDermott and Doris McDermott. Regd. office : 203, Lower Clapton Road, E.5.

Increases of Capital

Heyes & Co., Ltd.—Increased by £20,000, in £1 ordinary shares, beyond the registered capital of £30,000.

Telegraph Construction & Maintenance Co., Ltd.—Increased by £1,500,000, in £1 ordinary shares, beyond the registered capital of £1,500,000.

Phosphor Bronze Co., Ltd.—Increased by £150,000, in £1 ordinary shares, beyond the registered capital of £100,000. At 28th January, Birfield Industries, Ltd., held 99,982 £1 ordinary shares out of 100,000 issued.

British Electrical Repairs, Ltd.—Increased by £5,000, in £1 ordinary shares, beyond the registered capital of £200,000. At 15th April, British Engine Boiler & Electrical Insurance Co., Ltd., held 19,993 £10 ordinary shares out of 20,000 issued.

Liquidations

James Bros. (Wiltshire), Ltd., electrical engineers, The Parade, Trowbridge, Wilts.—Winding up voluntarily. Liquidator, Mr. J. E. Scheerer, 7, Bond Place, Leeds, 1, appointed 11th August.

N. H. Donkin, Ltd., refrigeration and electrical engineers, 31a, New York Street, Leeds, 1.—Winding up voluntarily. Liquidator, Mr. R. B. Smith, York House, 3, Alfred Street, Boar Lane, Leeds, 1, appointed 19th August.

Electrical & Associated Services (Mumbles), Ltd. (in voluntary liquidation).—Meetings of members and creditors at 20, Walter Road, Swansea, on 17th September to receive an account of the winding-up by the liquidator, Mr. B. Baddiel.

Central London Electricity Accessories, Ltd. (in voluntary liquidation).—Meeting of members at 46, New Broad Street, London, E.C.2, on 25th September to receive an account of the winding-up by the liquidator, Mr. H. J. Mellows, and to consider, and if thought fit pass, a resolution authorizing the liquidator to hand over the books, accounts and documents to the London Electricity Board.

Bankruptcies

M. K. Matthews, 150, Cranes Park Road, Sheldon, Birmingham, radio engineer.—First meeting 29th August at the Official Receiver's office, Somerset House, 37, Temple Street, Birmingham, 2. Public examination, 29th October, at The Court House, Corporation Street, Birmingham, 4.

A. J. Coles, electrical engineer and contractor, lately carrying on business at 2a, Pinner Road, Harrow, Middx.—Order for discharge made 25th July subject to bankrupt's consenting to judgment being entered against him for £50 and £1 10s costs, payable at the rate of £2 a month.

D. N. Bateman, residing and lately carrying on business as " Villiers Electric " at 1, North Villiers Street, Leamington Spa, radio and electrical engineer.—Trustee, Mr. R. K. Clark, Somerset House, 37, Temple Street, Birmingham, 2, Official Receiver, released 18th August.

H. L. Ruff, residing and carrying on business at 141, Abbeydale Road, Sheffield, electrical engineer.—First and final dividend of 20s in the £ and 4 per cent statutory interest payable at the Official Receiver's office, 55, Queen Street, Sheffield, 1.

J. L. Parker, 15, West Street, Horncastle, Lincs, electrician.—Adjourned public examination to be proceeded with on 25th September at the Guildhall, Stonebow, Lincoln.

J. Robertson, 68, Arran Road, Catford, London, electrical engineer.—Order made 19th June granting discharge subject to bankrupt consenting to judgment in the sum of £50 (£50 paid to Official Receiver in lieu of entering up judgment).

STOCKS and SHARES

THE development of what looked to be uncommonly like a boom in British Government securities has had a widely-spread effect upon Stock Exchange markets as a whole. Quotations for gilt-edged securities, including British Electricity and British Transport, have been substantially advanced under the influence of heavy buying on behalf of private investors as well as the institutional class. The movement has been gathering way for several weeks past, as reflected in the weekly notes here. The main cause assigned as the reason for the support to such stocks is the removal of any fear that the Bank Rate might be put up.

Pye Results

Although higher tax charges have reduced the net profit of Pye, Ltd., below last year's, the £70,000 rise in the group trading profit to £611,000 for the year to March last was regarded in the market as a good achievement in circumstances which must have presented many difficulties to the trade. The dividend for the year is repeated at the rate of 18 per cent, declared, last time, after the 100 per cent capital bonus. The distribution is again well within the surplus available and, as before, 5¼ per cent of the amount comes from the dividend reserve. Remaining steady at 16s after the news, the 5s deferred shares show a return of about £5 12s 6d per cent on the money.

Cossor Dividend

A.C. Cossor's declaration of a 10 per cent dividend, the first payment to ordinary shareholders for four years, was much in accordance with market expectations formed since the clearing up of preference dividend arrears last April. Sales by the group during the year ended last March are reported to have been the highest in the company's experience, and the trading profit of £488,000 came out a little better than that of the previous year. The increase was more than offset by larger taxation and other charges, but the net surplus still covers the ordinary dividend about twice over. Having fallen to 10s on the news, the 5s ordinary shares show now a yield of 5 per cent, which suggests faith in the further outlook.

Prospects

Satisfaction with the resumption of dividends on Cossor ordinary shares was tempered by considerations raised in Lord Burghley's statement which accompanied the figures. Apart from the general difficulties common at present to this field of trade, the timing of Cossor's recovery has been unfortunate so far as the excess profits levy is concerned; the group's standard for that purpose will be well below present performance. A factor of greater moment is the financial strain involved in carrying a much larger total of stocks and work in hand. In connection with this, the group overdrafts have become swollen by more than half-a-million pounds. Careful consideration is being given by the board to the question of how best to provide the necessary new capital. Until some decision has been made in this matter, there is likely to be a restraining influence upon the shares concerned.

Company News

There is no direct public interest in the shares of Pirelli-General Cable Works, but last week's declaration of a maintained dividend out of doubled net profits concerns shareholders of G.E.C., which owns half the issued capital, and can be noted with satisfaction by investors in other companies in the cable manufacturing group. Thorn Electrical Industries shares were unmoved by references in the full annual report to the probable need for substantial additions to financial resources, over the next two years, owing to the continued growth of the business. Indications are that the board has in mind the issue of a loan in some form, rather than an offer of shares. The 2s shares of Radio & Television Trust have remained quoted at about 6d since publication of the annual report.

Metal Industries

Among the many substantial rises which have occurred over the past month or two in industrial share prices, the improvement in Metal Industries £1 ordinary shares has been particularly conspicuous. It started with the declaration of the final dividend, making 15 per cent for the year ended in March, or 5 per cent more than the previous payment, together with the announcement of a 25 per cent share bonus. Before this, the shares were quoted about 37s. They stand now at 39s 3d, ex final dividend and bonus, so that to the appreciation of nearly 3s in the price there has been added more than 1s net for the final dividend and a free share for every four previously held. In declaring the capital bonus, Metal Industries advised shareholders that the maintenance of the latest rate of dividend on the larger capital should not be assumed.

Correction

In the Electrical Investments table in our last week's issue the middle price of Allen West 5s shares was incorrectly shown as 47s 6d. The price of these shares was unchanged at 10s 3d. It was the middle price of the Westinghouse Brake & Signal Co.'s shares which rose by 1s to 47s 6d.

Electrical Investments

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 25th Aug. 1952	Week's Rise or Fall	Est. Yield £ s d
Gilt-edged and Overseas Stocks					
Brit. Elec. 1968/73	3	3	83½xd	+⅜	3 11 10
Brit. Elec. 1974/77	3	3	82	+1	3 13 2
Brit. Elec. 1976/79	3½	3½	89½	+2	3 18 3
Brit. Elec. 1974/79	—	4½	99xd	+1	4 5 9
Calcutta Elec. ..	6†	6†	20/6	—	5 17 1†
East African Power	7	7	26/6	+1/-	5 5 8
Nigerian Elec. ..	10	10	21/3xd	—	—
Palestine Elec. "A"	5†	5†	13/6	—	7 8 2†
Perak Hydro-Elec.	Nil	Nil	13/3	+9d	Nil
Equipment and Manufacturing					
Aberdare Cables (5/-)	20	20	13/9	—	7 5 6
Aerialite (1/-) ..	83½	88½	7/6	—	11 14 6
Aron Elec. Ord. ..	15	15	33/9	—	8 17 9
Assoc. Elec. Ord. ..	20	20	69/6	—	5 15 2
Automatic Tel. & El.	15	15	57/6	—	5 4 2
Babcock & Wilcox	18	18	70/-	—	5 2 10
Baldwin, H. J. (2/-)	25	25	4/9	—	10 10 6
Bakelite (10/-) ..	—	—	17/6	+6d	—
British Aluminium	10	12	43/3	+1/9	5 11 1
B.I. Callender's ..	7½	9	30/9	+6d	5 17 0
British Thermostat (5/-)	30	30	24/6	—	6 2 5
British Vac. Cleaner (5/-)	25	25	13/-	—	9 12 4
Brook Motors (10/-)	20	20	28/9	—	6 19 2
Brush Ord. (5/-) ..	10	10	5/9	—	8 13 10
A. F. Bulgin (1/-) ..	27½	30	2/6	—	12 0 0
Burco (5/-) ..	42½	38½	19/6	—	9 18 6
Chloride El. Storage	15	15	58/9	—	5 2 0
Cole, E. K. (5/-) ..	25	25*	15/9	+3d	7 18 9
Cossor, A. C. (5/-)	Nil	10	10/-	−2/-	5 0 0
Crabtree (10/-) ..	17½	17½	33/-	+6d	5 6 0
Crompton Parkinson Ord. (5/-) ..	11½	11½	8/6	—	6 12 3
De La Rue (5/-) ..	50	35*	12/-	+6d	7 12 2
Decca (1/-) ..	112½	112½	18/3	+2/6	6 0 0
Dewhurst (2/-) ..	35	22½*	4/3	—	—
Dictograph Tel. (2/-)	20	20	4/6	—	8 17 9
E.M.I. (10/-) ..	8	12	15/6	+3d	7 14 9
Electrical Components (5/-) ..	20	20	10/-	—	10 0 0
Elec. Construction	15	15	47/6	—	6 5 3
Enfield Cable Ord.	7½	7½	21/-	—	7 2 10
English Electric ..	15	15	56/-xd	+6d	5 7 2
Ericsson Tel. (5/-)	22†	22*†	40/-	+⅛	2 15 0†
Ever Ready (5/-) ..	35	35	25/-	+6d	7 0 0
Falk Stadelmann	15	15	36/-xd	+1/-	8 6 8
G.E.C. Ord. ..	17½	22½	83/6	—	5 7 10
General Cables (5/-)	30	30	12/6	—	12 0 0
Greenwood & Batley	15	15	37/-	—	8 2 2
Hackbridge Cable (5/-)	20	20	10/9	—	9 6 0
Hackbridge Hewittic (5/-)	18	20	16/3	+⅛	6 3 0
Hall Tel. Acc. (10/-)	10	10	10/-	—	10 0 0
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (5/-) ..	20	20	17/3	+3d	5 16 0
Holophane (5/-) ..	15	15	10/9	+9d	—
Hoover (5/-) ..	37½	35*	25/3	+6d	6 18 6
Equipment and Manufacturing (continued)					
Intl. Combustion (5/-)	20	25	24/9	+2/-	5 1 0
Johnson & Phillips	15	15	52/-	—	5 15 5
Lancashire Dynamo	22½	12½*	43/9	—	5 14 2
Laurence, Scott (5/-)	12½	15	11/9	—	6 7 8
London Elec. Wire	10	12½	48/9	—	5 2 6
J. Lucas	17½	7½*	32/6	—	4 12 4
Marryat & S. (2/-)	22½	22½	5/-	—	9 0 0
Mather & Platt ..	12½	12½	43/-	—	5 16 4
Metal Industries ..	10	15	39/3	+6d	—
Mid. Elec. Mfg. ..	15	15	55/-	—	5 9 0
Murex	12½	15	54/6	+⅛	5 10 0
Newman Ind. (2/-)	6	10	2/3	−3d	8 17 10
Oldham & Son (1/-)	30	35	5/-	—	7 0 0
Parnall (Yate) (5/-)	6	6	3/3	—	10 0 0
Parsons, C. A. ..	15	10*	50/-	+⅛	4 0 0
Plessey (5/-) ..	20	22½	17/6	—	6 8 7
Pye Deferred (5/-)	18	18	16/-	—	5 12 6
Revo (10/-) ..	27½	27½	38/3	—	6 10 9
Reyrolle	15	10*	48/9	+4/3	4 2 0
Scot. Cable (4/-) ..	30	32	22/3	+1/6	5 15 3
Siemens Ord. ..	10	10	33/6	+6d	5 19 6
Strand Elec. (5/-) ..	17½	17½	8/9	—	10 0 0
Sturtevant (5/-) ..	16½†	17¼*†	23/-	—	—
Switchgear & Cowans (5/-)	22½	22½	13/9	—	8 3 8
Taylor T. (5/-) ..	20	20	20/-	—	5 0 0
T.C.C. (10/-) ..	20	20*	36/3	—	—
T.C. & M. ..	10	10	24/6	—	—
Telephone Mfg. (5/-)	10	10	7/9	−3d	6 6 0
Thorn Elec. (5/-) ..	10	12½	8/6xd	—	7 7 0
Tube Investments	25	25	54/3	+3d	—
Vactric (5/-) ..	Nil	Nil	4/6	—	Nil
Veritys (5/-) ..	Nil	7½	4/3	—	8 16 6
Walsall Conduits (4/-)	70	70	45/-	−9d	—
Ward & Goldstone (5/-)	44	45*	29/-	—	—
Watford (2/-) ..	25	25	6/-	—	8 6 8
Westinghouse Brake	14	14	47/6	—	5 18 0
West, Allen (5/-) ..	12½	15	10/3	—	7 6 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord.	—	4½	80	+2½	5 12 6
Ord.	—	56/3	50	+2	5 12 6
Anglo-Portuguese	8	8	20/9	+3d	7 14 3
Brit. Elec. Traction: Def. Ord. ..	22½	25	405	—	6 2 6
Cable & Wireless: Ord.	6	8	120	+7½	6 13 1
4% Loan ..	4	4	95½	−½	4 3 9
Calcutta Trams ..	6†	6†	23/6	—	5 2 2†
Cape Elec. Trams	4	5	12/6	—	8 0 0
Marconi Marine ..	7½	10	28/-	—	7 2 10
Oriental Tel. Ord.	16	16	55/-	—	—
Telephone Props.	8	8	31/3	—	5 2 7
Tele. Rentals (5/-)	10	10	8/-	—	6 5 0

* After capital bonus.
† Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 8th October from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1947

3021. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Refrigerating systems. 31st January, 1947. (680421.)

26922. Standard Telephones & Cables, Ltd., Deloraine, E. M., and Reeves, A. H.—Mixed modulation in pulsed intercommunication systems. 3rd December, 1948. (680702.)

1948

6700. Philips Electrical, Ltd.—Systems for transmitting images. 3rd March, 1948. (680424.)

8688. Bendix Aviation Corporation.—Electrical induction devices such as synchro units, alternating current generators, or motors. 24th March, 1948. Addition to 671632. (680425.)

15721. Marconi's Wireless Telegraph Co., Ltd., Cooper, V. J., Nixon, J. E. A., and Smith, N. N. P.—Electrical coupling networks. 24th February, 1949. (680612.)

16671. Automatic Electric Laboratories, Inc.—Toll-switching telephone system. 21st June, 1948. (680521.)

18302. Marconi's Wireless Telegraph Co., Ltd., and Brandon, P. S.—Radar systems. 22nd April, 1949. (680704.)

20624. Marconi's Wireless Telegraph Co., Ltd., and Brandon, P. S.—Radar systems. 21st July, 1949. (680705.)

21796. Philips Electrical, Ltd.—Optical projection screens. 18th August, 1948. (680522.)

1949

3438. British Thomson-Houston Co., Ltd., Milner, C. J., and Watts, B. N.—Light sensitive lead sulphide cells. 11th January, 1950. (680707.)

3695. British Thomson-Houston Co., Ltd., Milner, C. J., and Watts, B. N.—Construction of sealed vitreous envelopes suitable for use, for example, in constructing radiation-sensitive cells. 2nd February, 1950. (680708.)

7480. General Electric Co., Ltd., James, E. G., and Kyte, D. J.—Crystal-contact devices. 24th April, 1950. (680528.)

9379. Cye-Arc, Ltd., Ainsworth, A. R., and Miller, J. B.—Apparatus for electric arc stud welding. 17th March, 1950. Cognate application 533, 9th January, 1950. (680531.)

10154. Allis-Chalmers Manufacturing Co.—Hydraulic apparatus. 14th April, 1949. (680532.)

10528. Telefon Fabrik Automatic Aktieselskab, and Ungar, E.—Arrangements in metering circuits of remote signalling systems. 20th April, 1949. (680625.)

12059. Hunt, Ltd., A. H., and McKay, A. R.—Electrical capacitor filter units. 5th May, 1950. (680432.)

12064. General Electric Co., Ltd., Earp, H. J. C., and Ferris, E. C.—Trolley wire systems. 5th May, 1950. (680433.)

12393. Liebmann, D. M.—Resistances. 23rd June, 1950. (680626.)

13154. General Electric Co., Ltd., Davis, G. E., and Judd, S. R.—Servo systems. 17th May, 1950. (680627.)

13621. Peters, M. F.—Method of manufacturing fire detector and other cables. 21st May, 1949. (680434.)

14984. General Electric Co., Ltd., and Harper, R.—Conveyors. 5th June, 1950. (680538.)

16754. Bakelite, Ltd.—Laminated products. 24th April, 1950. (680437.)

17640. Robertson, Ltd., D. R., and Sampietro, A. C.—Rotary annular electromagnets. 28th June, 1950. (680440.)

17641. British Broadcasting Corporation, and Walker, H. S.—Cooling means for electron discharge valves. 30th March, 1950. (680540.)

18398. Gilbert, T. J., and J. B. Fermor-Hesketh.—Electric switchgear cases. 11th July, 1950. (680442.)

19707. Electric & Musical Industries, Ltd.—Circuits for establishing a d.c. component in electrical signals. 19th July, 1950. (680544.)

19801. National Research Development Corporation.—Electrical calculating machines. 7th September, 1950. (680546.)

21235. Marconi's Wireless Telegraph Co., Ltd.—Radar systems. 7th July, 1950. (680548.)

23972. Modern Telephones (Great Britain), Ltd., and Ivens, E.—Intercommunication telephone systems. 15th September, 1950. (680765.)

24397. Electro-Hydraulics, Ltd., and Perdue, J.—Fluid-pressure-operated control systems. 8th December, 1950. (680722.)

24644. Cribb, E. G.—Means for holding, displaying and packaging for sale electrical resistances, condensers, and like components having wire tags. 27th December, 1950. (680632.)

24858. Marine Engineering Co. (Stockport), Ltd., Smith, F., and Mann, B. G.—Electric drive unit for looms and the like. 25th August, 1950. (680723.)

26905. Siemens & Halske Akt.-Ges.—Teleprinting apparatus. 19th October, 1949. (680633.)

27629. Jackson, H.—Automatic burglar and fire alarms. 26th January, 1951. (680634.)

29341. General Electric Co., Ltd., Nelson, E. H., and Whittemore, J.—Quartz-metal seals for electric discharge devices. 16th October, 1950. (680452.)

31025. Metropolitan-Vickers Electrical Co., Ltd.—Multi-break electric circuit breakers. 21st November, 1950. (680456.)

31104. Morris Electrical Engineering Co., Ltd., J., and Wilcox, K.—Means for controlling variable electrical resistances, inductances, condensers or the like. 6th November, 1950. (680724.)

31685. English Electric Co., Ltd.—Boundary layer control. 1st December, 1950. (680458.)

31701. Leeds & Northrup Co.—Temperature measurement of molten materials. 2nd January, 1950. (680770.)

33118. British Insulated Callender's Construction Co., Ltd.—Cable winches. 28th December, 1950. (680462.)

33226. Western Electric Co., Inc.—Method and apparatus for growing quartz crystals. 29th December, 1949. (680773.)

1950

918. Standard Telephones & Cables, Ltd. (Aigrain, P. R. R.).—Frequency band reducing system for television transmissions. 13th January, 1950. (680648.)

1156. Automatic Telephone & Electric Co., Ltd.—Electromagnetic relays. 9th January, 1951. (680562.)

1235. British Telecommunications Research, Ltd.—Regenerative repeaters for use in telegraph systems. 1st January, 1951. (680726.)

1476. British Thomson-Houston Co., Ltd., and Jack, W.—Apparatus for stripping insulation from electric conductors. 19th September, 1950. (680650.)

1941. Allmanna Svenska Elektriska Aktiebolaget.—Air-blast circuit breakers having means for reducing eddy formation in the air blast. 3rd August, 1951. (680465.)

1950. National Research Development Corporation.—Pulse scaling systems using multi-electrode gas-discharge tubes. 23rd January, 1951. (680466.)

3955. Cole, Ltd., E. K., and Burnard, C. L.—Tone control arrangement for a low frequency signal amplifier. 15th February, 1951. (680568.)

5597. British Thomson-Houston Co., Ltd., Welch, D. F., and Randall, K. B.—Circuit arrangements for producing energy pulses. 21st February, 1951. (680573.)

5990. British Thomson-Houston Co., Ltd.—Driving mechanisms for clothes washing machines. 9th March, 1950. (680658.)

6735. General Electric Co., Ltd., and Dix, J. C.—Electric current stabilizing circuits. 8th March, 1951. (680574.)

7078. Hunt (Capacitors), Ltd., A. H.—Capacitors with metallized dielectric. 15th March, 1951. (Addition to 647573.) (680472.)

7249. Copeland & Sons, Ltd., W. T., and Copeland, R. S. C.—Drying of ceramic articles by radio-frequency heating. 27th March, 1951. (680660.)

7431. Standard Telephones & Cables, Ltd.—Multi-stylus facsimile machines. 24th March, 1950. (680661.)

7938. N.G.N. Electrical, Ltd.—Laminated magnetic cores for electric transformers. 28th March, 1951. (680577.)

9131. British Thomson-Houston Co., Ltd.—Shaft bearings. 13th April, 1950. (680478.)

10399. Mallett, H. W., Mallett, E. B., and Turk, B. S. (Personal representatives of Mallett, E. (deceased)).—Devices for electrifying wire fences. 27th April, 1951. (680665.)

10973. Maschinenfabrik Oerlikon.—Method of regulating gas turbine plants. 3rd May, 1950. (680667.)

11368. Oestrich, H.—Means for cooling the blades of gas turbine engines. 8th May, 1950. (680581.)

16356. Visi-Chick Brooder Co., Ltd.—Transportable electric motor-driven units. 2nd July, 1951. (680731.)

17562. British Thomson-Houston Co., Ltd., and Lndbrook, L. C.—Alternating current rectifying circuits. 5th July, 1951. (680585.)

19303. Aladdin Industries, Inc.—Variable inductors for high-frequency tuning applications. 2nd August, 1950. (680781.)

19465. Siemens-Schuckertwerk Akt.-Ges.—Arrangement for the self-centring, magnetic, partial load relief of upright measuring apparatus and in particular meters. 3rd August, 1950. (680679.)

19889. Alkaline Batteries, Ltd.—Multi-cell electric accumulators. 20th July, 1951. (680739.)

19890. Alkaline Batteries, Ltd.—Lids of electric accumulators. 19th July, 1951. (680740.)

19891. Alkaline Batteries, Ltd.—Multi-cell electric accumulators. 18th July, 1951. (680741.)

21261. Aladdin Industries, Inc.—Radio-frequency transformer. 28th August, 1950. (680782.)

21438. Soudure Autogène Française.—Manufacture of multiple welding electrodes. 30th August, 1950. (680590.)

21746. British Thomson-Houston Co., Ltd.—Phonograph pickups. 4th September, 1950. (680684.)

22651. Radio Corporation of America.—Colour television system. 14th September, 1950. (680783.)

23348. Ingvardsen, J. F. I.—Refrigerating unit. 22nd September, 1950. (680591.)

23422. Aktiebolaget Ljungstroms Angturbin.—Rotary regenerative air preheaters. 25th September, 1950. (680592.)

23567. British Thomson-Houston Co., Ltd. (General Electric Co.).—Electronic mapping systems. 26th September, 1950. (680594.)

24353. Gretener, E.—Device for producing current impulse combinations. 5th October, 1950. (680500.)

25069. Bendix Aviation Corporation.—Electrical induction devices such as synchro units, alternating current generators or motors. 13th October, 1950. Addition to 671632. (680503.)

26220. Standard Telephones & Cables, Ltd.—Voice frequency signalling in telecommunication systems. 27th October, 1950. (680746.)

28183. Sperry Corporation.—High-frequency electric discharge tube apparatus. 17th November, 1950. (680597.)

30894. British Thomson-Houston Co., Ltd.—Elastic-fluid turbines. 19th December, 1950. (680598.)

31584. Standard Telephones & Cables, Ltd.—Antenna assembly. 29th December, 1950. Addition to 677866. (680512.)

1951

1034. Hoover, Ltd.—Dynamo-electric machines. 15th January, 1951. (680752.)

1889. Marconi's Wireless Telegraph Co., Ltd.—Apparatus for making grids for electron discharge tubes. 25th January, 1951. (680693.)

3300. Tipping, F. C.—Time delay control of electrical apparatus. 7th May, 1951. (680601.)

4330. British Thomson-Houston Co., Ltd.—Pumps. 22nd February, 1951. (680516.)

4375. Union Carbide & Carbon Corporation.—Anodes for primary galvanic cells. 23rd February, 1951. (680602.)

4376. Union Carbide & Carbon Corporation.—Primary galvanic cells. 23rd February, 1951. (680603.)

7215/6. Automatic Electric Laboratories, Inc.—Toll switching telephone system. 21st June, 1948. Divided out of 680521. (680607/8.)

7556. Mallory Batteries, Ltd.—Casings or enclosures for electric batteries or electrolytic condensers. 2nd April, 1951. (680697.)

12183. British Thomson-Houston Co., Ltd.—Methods of making and casting cemented carbide articles. 24th May, 1951. (680698.)

17720. Pirelli Soc. per Azioni.—Electric cables. 26th July, 1951. (680519.)

Amended Specification

644935/6. Standard Telephones & Cables, Ltd.—Electric pulse code modulation systems of communication.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 13th September.

FALCON (design). No. B705,777. Class 9. Radiogramophones, radio sets (complete), television receivers and component parts, included in Class 9, of all these goods.—John Street Manufacturers, Ltd., 117, Manor Lane, Lee, London, S.E.12.

FENWAL (design). No. 706,009, Class 9. Apparatus for automatically controlling and detecting temperature, being goods for use with electrical circuits and thermal systems; parts of and fittings for the aforesaid apparatus, all being goods included in Class 9; and instruments and apparatus for testing the aforesaid goods.—Fenwal Incorporated, City of Ashland, Massachusetts, U.S.A. Address for service, c/o Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

SOLARTRON. No. 706,195, Class 9. Electronic and electrical apparatus and instruments, all included in Class 9; scientific, nautical, surveying, radio, television, photographic, cinematographic, optical, weighing, measuring, signalling, checking (supervision), teaching, counting, accounting, adding and calculating apparatus and instruments; apparatus and instruments for recording and indicating pressure, temperature and speed; sound recording, transmitting and reproducing apparatus and instruments; and parts included in Class 9 of all the aforesaid goods.—Solartron Laboratory Instruments, Ltd., 22, High Street, Kingston-on-Thames, Surrey.

TOCCO. No. B691,567, Class 11. Electric induction heating apparatus for the treatment of metals.—Electric Furnace Co., Ltd., 17, Victoria Street, London, S.W.1.

SUNSHINE. No. B703,358, Class 11. Electric lighting sets for Christmas trees and for similar decorative purposes.—Britannia Electric Lamp Works, Ltd., 17-23, Sunbeam Road, Chase Estate, London, N.W.10.

SOLWARM. No. 708,061, Class 11. Electrically heated blankets (not for medical purposes).—Robert Holt (Middlesex), Ltd., Florence Buildings, Florence Road, Edmonton, London, N.18.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Carlisle.—City Council. Electrical installations in 32 houses on the Harraby site. City engineer, 18, Fisher Street.

Glendale (Northumberland).—Rural District Council. Supply of 43 electric cookers for new houses. Clerk, R.D.C. Offices, Wooler.

Goole.—8th September. Borough Council. Vertical spindle centrifugal pump (borehole type), driven by electric motor, for the waterworks. Silcock & Simpson, engineers, 10, Park Row, Leeds, 1.

Hull.—4th September. City Council. Installation of electricity at Appleton County Primary School. City architect, Guildhall.

New Zealand.—AUCKLAND.—22nd September. Hospital Board, Auckland. X-ray equipment for the screening room of the main X-ray Department at Auckland Hospital, Park Road, Auckland, C.3. (C.R.E. 28917/52. Ten/4525.)*

WELLINGTON.—9th October. Post and Telegraph Department. Circuit breakers and switches. (C.R.E. 29001/52. Ten/4537.)*

Portuguese East Africa.—LOURENCO MARQUES.—3rd October. Companhia de Mozambique. Provision and installation of three passenger lifts, one baggage lift and three service lifts for the Grand Hotel in Beira. (C.R.E. 28730/52. Ten/4528.)*

Sheffield.—12th September. City Council. Installation of electricity at the Secondary Modern School for Boys, Hurlfield. W. G. Davies, city architect, Town Hall, 1.

Stockton-on-Tees.—Town Council. Electrical work at 79 houses under construction on the Roseworth housing estate. T. C. Hartley, borough architect, 28, The Square.

Uruguay.—MONTEVIDEO.—10th September. Administracion Municipal de Transportes Colectivos (AMDET). Supply of 16,000 kg of bare or lightly covered iron-wire electrodes for rail welding. (C.R.E. 28698/52. Ten/4524.)*

25th September. Usinas Electricas y Telefonos del Estado. Supply of bare copper conductors. (C.R.E. 28496/52. Ten/4522.)* 30th September. Various articles for use in electrical installations. (C.R.E. 28495/52. Ten/4503.)*

28th November. Servicio de Transmissiones (Direccion General de Comunicaciones). Oscilloscope, impedance bridge and tester. (C.R.E. 28726/52. Ten/4532.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Wrexham.—8th September. Rural District Council. Wiring for power 212 houses at Llay, with certain alterations to the lighting circuits. Surveyor, Regent Street Offices.

ORDERS PLACED

Barrow-in-Furness.—Corporation. Recommended. Electrical installation, South Newbarns County Infants' School (£1,742).—N.W. Electricity Board.

Kendal.—Corporation. Recommended. Electrical installations in 78 dwellings to be erected at Hall Garth (£2,776).—R. Hadwin & Son.

London.—ST. MARYLEBONE.—Public Libraries Committee. Installation of lighting and other electrical equipment, East Branch Library (£407). —G. & S. Electrical Services, Ltd.

Northwich.—U.D.C. Accepted. Electrical installations in 100 houses, Leftwich estate (£1,916).—Gorst E. Oakes.

Sheffield.—Transport Committee. Recommended. Electrical installation (phase 2), Herries Road Bus Garage (£1,198). —Hall & Stinson, Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abingdon.—Houses (148) on Dean Court Estate, Botley; R.D.C. surveyor, Bath Street.

Bathavon.—Houses (102), Red Post site, Peasedown; Richards Developments, Ltd., Upwey, Dorset.

Birkenhead. — Extensions, Oxton Road; James McKenzie, Ltd., electrical engineers.

Birmingham. — Plastic surgery unit at Wordsley Hospital for Regional Hospital Board; J. Hickman & Son (Brierley Hill), Ltd. (£10,786). Factory, Moor Lane, Witton; Connaught Engineering Co., Ltd., Witton Lane, 6.

Chatham.—Houses (101) on Weeds Wood Estate, for T.C.; Peak Construction Co., Ltd., builders, Strood, Kent.

Colwyn Bay.—Houses (180) at Elwy Road, Rhos-on-Sea, for T.C.; architect, S. C. Foulkes, Central Chambers.

Darlington.—Offices, Princes Street; British Railways (Eastern Region), York.

Edinburgh.—Houses (208) at Liberton; city engineer, 329, High Street.

Epsom.—Dwellings (114), Chessington Road and Mouthill, for T.C.; borough surveyor.

Greenock.—New dock storage and dockers' buildings at Custom House Quay for the Harbour Board; Frank Burnet, Boston & Bell, 180, Hope Street, Glasgow, C.1.

Halifax.—County infants' school, Ling Bob site; borough engineer.

Hereford.—Houses (92) and 164 flats at Newton Farm Estate for T.C.; Selleck Nicholls & Co., Ltd., St. Austell, Cornwall.

Huntingdon.—Houses (50), American Lane (south side), for T.C.; E. B. Parkinson, Council's architect.

Kingston-on-Thames.—Showrooms and offices, Clarence Street area; Thomas Lowe & Sons, Ltd., engineers and contractors, Broadway Chambers, Riverside, W.6.

Leicester.—Extensions to City of Leicester Training College (Coppice Hall of Residence), for T.C.; J. H. Lloyd Owen, city architect, 7, Newarke Street.

London.—BALHAM.—Kitchens, dining rooms, etc., St. James's Hospital; South West Metropolitan Regional Hospital Board, 11a, Portland Place, W.1.

HERNE HILL.—Flats (132) and 30 houses, Rosendale Road; Gollins, Melvin & Partners, architects, 21, Russell Square, W.C.1.

PADDINGTON.—Shop and flats, Edgware Road; Corob Construction Co., Ltd., 1, Bartholomew Buildings, Seward Street, E.C.1.

SHEPHERDS BUSH.—Paint factory extension; Silexine, Ltd., paint manufacturers, Richford Street, W.6.

Longbenton.—Engineering works on 100 acres site for Vickers-Armstrongs, Ltd., Newcastle-on-Tyne.

School (£100,000), and extensions to two schools (£45,000); county architect, County Hall, Newcastle.

Lowestoft.—Works extensions; Brooke Marine, Ltd., Harbour Road.

Luton.—Additional hangar at Airport; borough engineer.

Housing development, Vauxhall Park estate; H. C. Janes, Ltd., 183, Hightown Road.

Manchester.—New R.C. Secondary School at Newall Green; Reynolds & Scott, architects, 9, Albert Square.

Mansfield.—Houses (86), Ladybrook estate; borough engineer.

Market Deeping.—New mixed secondary modern school proposed by Kesteven County Council (estimated cost £52,000); county architect, Sleaford, Lincs.

Middlesbrough.—Houses (44) at Park End for the T.C.; A. Cubitt, builder, Eastbourne Road.

Houses (66) at Berwick Hills for the T.C.; direct labour.

Middleton.—Houses (94), Hollin Estate, for T.C.; W. Mitchell, Ltd., builders, Acresfield Road.

Newcastle-on-Tyne.—Church, Cleveland Gardens; Edwards and Manby, architects, 52, Eldon Place.

Layout of site at Kenton Lane for 2,000 houses; city architect.

Northampton.—Houses (91), Kingsthorpe Grove; borough architect.

Peterlee (Co. Durham).—Houses (430), south of Howletch Lane, for the Peterlee Development Corporation, Castle Eden, Co. Durham.

Ramsgate.—Houses (40), on the Belvedere Estate (£54,603); J. Moody, builder, St. Luke's Avenue.

Rowley Regis.—Houses (74) at Brickhouse Farm estate for T.C.; director labour.

St. Helens.—Erection of St. Matthew's Church, Grange Park; R. S. Ellison, Windle City.

Houses (600), Derbyshire Hill; Coal Industries Housing Association, Hobart House, S.W.1.

Southport.—Mental colony at Greaves Hall site; regional architect to Liverpool Regional Hospital Board, Church Street, Liverpool.

South Shields.—Children's home at Simonside for the T.C.; borough engineer.

Additions to Girls' Technical Grammar School and new secondary modern mixed school at Whiteleas for the E.C.; Page, Son & Hill, architects, 75, King Street.

Spalding.—Houses (23) on St. Paul's Estate for U.D.C.; Council's architect.

Stafford.—Proposed new civic offices for T.C.; architect, C. Cowles Voysey, 2, Bunkers Hill, London, N.W.11.

Stanley (Co. Durham).—Houses (47) at South View, Annfield Plain for the U.D.C.; direct labour.

Stockton-on-Tees.—Additions to Portrack Hospital for Newcastle Regional Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne (£10,000); P. H. Knighton, Board's chief architect.

Stretford.—New R.C. Secondary School at Firswood; Greenhalgh & Williams, architects, 15, Mawdsley Street, Bolton.

Sunderland.—Bottling factory for J. Deuchar, Ltd.; D. Glen, Albert Road, Jarrow.

Tynemouth.—Factory, offices and canteen, Coast Road, for Lignum Products, Ltd.; J. M. Angus, architect, 21, Lovaine Place, Newcastle-on-Tyne.

Road haulage depot for the Road Haulage Executive, Northumberland Road, Newcastle-on-Tyne.

Houses (118) at Marden South for the T.C.; borough engineer, 16, Northumberland Square, North Shields.

Wakefield.—Canteen and office block; Fall Ings Foundry Co., Ltd., Ings Road. Houses (100), Kettlethorpe estate; city engineer.

Walsall.—Houses (140) on the Daw End estate, Rushall; M. E. Habershon, borough surveyor, Council House.

Warrington.—52 houses at Orford estate for B.C.; Clough & Gaskell, Ltd., Wigan (£69,393).

Whitley Bay.—School (£134,640); county architect, County Hall, Newcastle.

Widnes.—First section of college of further education scheme (£73,341), for Lancs. E.C.; United Kingdom Construction & Engineering Co., Ltd., Kirkby, Liverpool.

Wolverhampton.—Works extensions (£135,000); Laystall Engineering Co., Ltd., Green Lane, Addersley.

Worthing.—Bungalows (41), Downside Avenue; Monks Farm Estate, Ltd., South Street, Lancing.